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National Eutrophication Survey (NES) data for a nationwide collection of 928 nonpoint source watersheds were studied for relationships between macro-drainage area characteristics (particularly land use) and nutrient levels in streams. Both the total and inorganic forms of phosphorus and nitrogen concentrations and loads in streams were considered.

For both nationwide and regional data sets, significant correlations were found between general land use and nutrient concentrations in streams. Mean concentrations were considerably higher in streams draining agricultural watersheds than in streams draining forested watersheds. The overall relationships and regionalities of the relationships and interrelationships with other characteristics are illustrated cartographically and statistically.

Two methods are provided for predicting nonpoint source nutrient levels in streams; one utilizing mapped interpretations of NES nonpoint source data and the other, regional mathematical equations and mapped residuals of these equations. Both methods afford a limited accountability for regional characteristics.

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NONPOINT SOURCE--STREAM NUTRIENT LEVEL RELATIONSHIPS: A NATIONWIDE STUDY

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FOREWORD

Effective regulatory and enforcement actions by the Environmental Protection Agency would be virtually impossible without sound scientific data on pollutants and their impact on environmental stability and human health. Responsibility for building this data base has been assigned to EPA's Office of Research and Development and its 15 major field installations, one of which is the Corvallis Environmental Research Laboratory (CERL).

The primary mission of the Corvallis Laboratory is research on the effects of environmental pollutants on terrestrial, freshwater, and marine ecosystems; the behavior, effects and control of pollutants in lake systems; and the development of predictive models on the movement of pollutants in the biosphere.

This report relates phosphorus and nitrogen levels in streams to the nonpoint source influences which are present in their drainage areas and also demonstrates the geographic trends in stream nutrient levels in the contiguous United States. As such, the information provided herein should be of interest and utility to water quality managers.

A. F. Bartsch
Director, CERL

ABSTRACT

National Eutrophication Survey (NES) data collected from a nationwide network of 928 nonpoint-source watersheds were studied for relationships between macro-drainage area characteristics (particularly land use) and nutrient levels in streams. Both the total and inorganic forms of phosphorus and nitrogen concentrations and loads in streams were considered.

For both nationwide and regional data sets, good correlations were found between general land use and nutrient concentrations in streams. Mean concentrations were considerably higher in streams draining agricultural watersheds than in streams draining forested watersheds. The overall relationships and regionalities of the relationships and interrelationships with other characteristics are illustrated cartographically and by regression techniques.

Two methods are provided for predicting nonpoint source nutrient levels in streams; one utilizing mapped interpretations of NES nonpoint source data and the other, regional regression equations and mapped residuals of these regressions. Both methods afford a limited accountability for regional characteristics.

This report covers a period from June, 1972 to December, 1975; work was completed as of September, 1977.

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Geologic classification and mean annual stream phosphorus concentrations and exports from a nationwide set of 586 nonpoint source watersheds. Data grouped by overall land use category (Figure 29).

Geologic classification and mean annual stream nitrogen concentrations and exports from a nationwide set of 586 nonpoint source watersheds. Data grouped by overall land use category (Figure 30).

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The negatives of the colored stream nutrient concentration maps were prepared, under the direction of Dr. A. Jon Kimerling, by the Cartographic Services of the Department of Geography, Oregon State University.

Dr. Don A. Pierce was primarily responsible for the construction of the prediction models. Dr. Pierce and Dr. Dale H. P. Boland, David Deckebach and Donna West provided assistance with computer programming and statistical data manipulation.

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SECTION I

CONCLUSIONS

The analysis of watershed characteristics and stream nutrient runoff data for a nationwide set of 928 nonpoint-source (NPS) type watersheds indicates that:

1. There were good correlations between general land use and NPS nutrient concentrations in streams. Streams draining agricultural watersheds had, on the average, considerably higher nutrient concentrations than those draining forested watersheds. Nutrient concentrations were generally proportional to the percent of land in agriculture and inversely proportional to the percent of land in forest. Mean concentrations of both total phosphorus and total nitrogen were nearly nine times greater in streams draining agricultural lands than in streams draining forested areas.

2. In general, inorganic nitrogen made up a larger percentage of total nitrogen concentrations in streams with watersheds having larger percentages of agricultural land. The inorganic nitrogen component increased from about 18% in streams draining forested areas to almost 80% in streams draining agricultural watersheds. The inorganic (orthophosphorus) portion of the total phosphorus component stayed roughly at the 40% to 50% level regardless of land use type.

3. Several regional patterns were found in the relationships and interrelationships between macro-watershed characteristics and stream nutrient concentrations. The most noteworthy of these were:

    a. Mean annual phosphorus concentrations in streams draining forested watersheds in the west were generally twice as high as those in the east.

    b. In the east, mean inorganic nitrogen concentrations in streams draining forested watersheds were 2.3 to 3.3 times higher than in the western or central parts of the country. The inorganic-N concentrations were particularly high in New York, Pennsylvania, and western Maryland.

    c. Total and inorganic nitrogen in streams draining agricultural watersheds were considerably higher in the heart of the corn belt than elsewhere.

4. Differences in nutrient loads in streams associated with different land use categories were not as pronounced as differences in nutrient concentrations. Both mean total phosphorus and mean total nitrogen export from agricultural lands were about 2.9 times greater than that from forested lands; mean inorganic nitrogen export was over 13 times greater. Differences in magnitude between the relationships of concentration to land use and export to land use appear to be due mainly to differences in areal stream flow from different land use types, and to a lesser degree, to differences in the mean annual precipitation patterns and mean slope of study areas.

5. Relationships between nutrient levels in streams and "contributing" land use types (percent of drainage area in agricultural land plus the percent in urban land use [% agriculture plus % urban]) correlated better than those considering only one land use type. Separate regression analyses of % agriculture plus % urban against both the total and inorganic forms of phosphorus and nitrogen concentrations were performed. Regional equations from these analyses offer a limited predictive capability. However, slightly more complicated regional equations, which consider both the positive correlation between "contributing" land use percentage and stream nutrient concentrations and the negative correlation between percent of watershed in forest and stream nutrients, afford a somewhat better predictive capability, particularly for the western and central parts of the United States.

6. Because of the general availability of stream flow data and the difficulty of incorporating two factors with differing spatial and temporal variations into one model, stream nutrient export models were not constructed. It appears that the most accurate method of predicting export values or stream loads is to use the appropriate model to determine stream nutrient concentrations, obtain flow data from the U.S. Geological Survey Surface Water Records for the particular area(s) of interest, and make the necessary calculations.

7. Qualitative refinement of the simple prediction models for total phosphorus, orthophosphorus, total nitrogen and inorganic nitrogen concentrations are provided in maps of the residuals of each model. These maps indicate where, in the United States, nutrient concentrations can be expected to be greater, equal to, or less than those predicted by the models.

8. Three colored maps of NPS-related concentrations of total phosphorus, total nitrogen, and inorganic nitrogen in streams were compiled from interpretations of the NES data and relationships between the data and macro-watershed characteristics. They provide planners, managers, and other users with a broad national overview of the NPS stream-nutrient-level relationships. In addition, a quick and relatively accurate method utilizing these maps is provided for predictions of NPS stream nutrient concentrations in

watersheds, basins, or regions where detailed information necessary for more accurate predictions is unavailable.

9. Using a geological classification scheme based on origin and the National Eutrophication Survey nutrient data, no clear relationships were found between geology and phosphorus or nitrogen in streams. Another classification scheme based on phosphorus composition of major rock types revealed only slight relationships, too slight to provide assistance in the compilation of predictive models.

10. No good correlations were found between drainage density (stream lengths per unit area of watershed) and stream nutrient levels.

SECTION II

INTRODUCTION

With increasing population densities, higher standards of living, and increasing demands on natural resources in our country, we are becoming more and more aware of the insidious effects our existence, life styles, and demands are having on the water quality in our lakes and streams. Public Law 92-500, enacted in 1972, was a result of this awareness and our interest in understanding just how we are affecting the quality of our surface waters and what our alternatives might be for doing something about it, should we choose to do so. One of the key areas addressed by Public Law 92-500, contained in Section 208, deals with the impacts of nonpoint sources on surface waters. The area of nonpoint source (NPS) impact is extremely difficult to understand, much more so than point-source impact, because of the spatial, as well as temporal, relationships and interrelationships involving the various water quality parameters and the various nonpoint sources, both natural and anthropogenic.*

The primary purpose of this study is to help clarify one aspect of the water quality--NPS impact area, that of phosphorus and nitrogen levels in streams. Although recently considerable effort has been spent on gaining a better understanding of the subject, and particularly on developing predictive methods, most of this work has been site specific. That which has been directed toward providing regional and national perspectives and related predictive methods has been largely theoretical and/or based on empirical data from different sources, taken at different times, and using different sampling and laboratory methods. Understandably, the results of these studies have been varied, and application of the results by planners and managers in their problem assessment tasks has been cumbersome and frequently without sound basis.

The relationships and predictive tools provided in this paper are based on tributary data collected from a nationwide set of 928 nonpoint-source watersheds in which land uses and other NPS characteristics were generally typical of the areas they represented. The stream sampling was conducted monthly for one year. Sampling and laboratory methods were uniform throughout the entire data set. For the purpose of this study, NPS watersheds are defined as those without municipal and industrial waste discharges and animal feedlots identified as point sources.

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*As used in this report anthropogenic refers to influences or impacts of man's activities on natural systems.

It is felt that the relationships and predictive methods presented in this study will be helpful in giving planners and managers a spatial picture of nutrient levels which can be attributed to nonpoint sources in their geographical areas of interest as well as logical, easy to use, general predictive tools for use in areas where extensive hard data are unavailable for more exacting procedures. The results presented should also be useful for interpreting the applicability of site-specific study results.

SECTION III

APPLICATIONS

For those tasked with assessing the impacts of nonpoint sources on nutrient levels in streams, the avenues of approach are generally dictated by one or more of the following: (1) availability of resource materials, such as stream nutrient data, land use maps, and aerial imagery; (2) availability of time and personnel; and (3) availability of funds. The best possible situation, of course, is to have enough stream nutrient data to make the necessary assessments quickly and at little expense. If, on the other hand, a planner lacks sufficient stream nutrient data to make the assessments but has enough time and money to conduct a sampling program, collecting the data through stream sampling would be the logical route. The methods outlined in this study are intended for use in those situations where adequate stream nutrient data are unavailable and time and/or money constraints preclude a sampling program. In this section, examples are given to indicate when and how the suggested methods might be used.

One of the most likely situations a planner is apt to encounter is a lack of stream nutrient data to make assessments of NPS impacts as well as a lack of time and money to conduct a sampling program. However, for the particular geographical area of interest, it is probable that there are either good quality land use maps or recent usable aerial imagery from which the general land use can be determined. Even if the land use has to be determined from available aerial photography, the cost (in terms of time and funds) probably is a small fraction of that needed to complete a stream sampling program. The suggested approach for this type situation would be use of the regional regression models shown in Table 9 (page 62) together with the residuals of the model.

A simple example of this is provided here, considering the estimation of total nitrogen stream levels attributable to nonpoint sources in the Willamette River watershed upstream from Salem, Oregon. Relatively accurate percentages of the forested, agricultural, and urban land use can be obtained from land use maps and/or aerial imagery; but for purposes of this example, percentages were estimated from more general sources. Forest was estimated to cover about 49% of the watershed; agriculture, 37%; and urban, 1%. Using the total nitrogen concentration model for the western region (Table 9; page 62) and the regional characteristics of values used to compile the model (Figure 27; page 69), the prediction for the sample watershed is made as follows:

$$\text{Log}_{10}\ (\text{NCONC}) = -0.03665 + 0.00425\ (38) - 0.00376\ (49)$$

$$\text{Log}_{10}\ (\text{NCONC}) = -0.03665 + 0.16150 - 0.18420$$

$$\text{Log}_{10}\ (\text{NCONC}) = -0.05935$$

However, judging from the values shown in Figure 27, one would expect the predicted values in this geographical area to be at least 0.5 standard deviations below that predicted by the model. Since the standard deviation is the Log_{10} value of the multiplicative standard error, Log_{10} of 1.75 = 0.24304 and 0.5 standard deviations is 0.12152. Therefore,

$$\text{Log}_{10}\ (\text{NCONC}) = -0.05935 - 0.12152$$

$$\text{Log}_{10}\ (\text{NCONC}) = -0.18089$$

$$\text{TNCONC} = 0.659\ \text{mg/l}$$

The mean annual export (load) of total nitrogen attributable to nonpoint sources is computed using U.S. Geological Survey (USGS) flow records (which if not available for a given location can be estimated based on USGS flow per unit area records for similar adjacent or nearby watersheds) and the equation given on page 23 of this report. Total nitrogen export for the sample watershed is computed as follows:

$$\text{Annual T-N Load} = 0.659\ \text{mg/l} \times 674\ \text{m}^3\text{/sec.} \times 31{,}536$$

$$\text{Annual T-N Load} = 14{,}007{,}200\ \text{kg.}$$

Using the area for the sample watershed (18,900 km^2), the export per unit area is computed to be 741 kg. total nitrogen per square kilometer per year.

The procedures for predicting inorganic nitrogen, total phosphorus, and orthophosphorus stream levels are similar. Moreover, the procedures for predicting the nutrient levels attributable to nonpoint sources up-gradient from any point on any stream are similar. Only general land use (as defined in this study) and stream flow (if export predictions are desired) data need to be computed from other sources for each watershed. It should be stressed that these procedures are estimative; interpretations of their accuracy are given in Section V of this paper. Logically, accuracy will be better in parts of the United States where densities of NES data were the greatest and/or where relationships between NES data and NPS watershed characteristics appear most significant. In areas where surface runoff is minimal or topographic watersheds are difficult or impossible to define, the procedures will be less accurate.

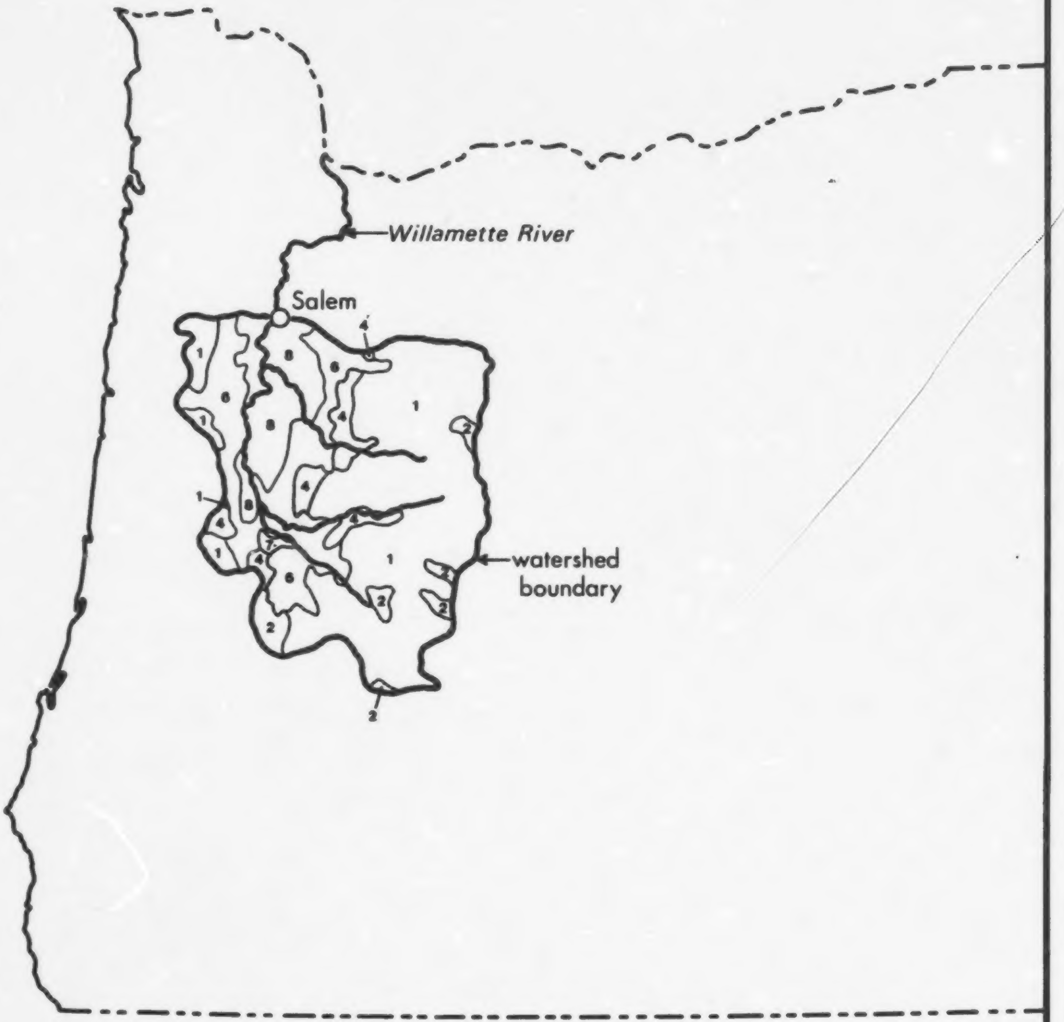
Another situation a planner is likely to encounter is also one of lacking stream nutrient data and sufficient time and money to carry out a sampling program, but in this case either being unable to obtain good quality land use data or lacking time or money necessary to obtain aerial imagery (if available) and interpret it for land use identification. For situations such as this, quick and relatively accurate assessments generally can be made using the colored maps in the back cover jacket of this report. Illustration of how the maps can be interpreted to make these assessments is provided below by again using as an example the assessment of total nitrogen levels from nonpoint sources in the Willamette River watershed upstream from Salem, Oregon. The general procedures are as follows:

1. Outline the topographic watershed of the Willamette River at Salem on a 1:500,000 USGS topographic map and a 1:3,168,000 USGS map of the U.S. (1:500,000 USGS topographic maps are available for all the states and the 1:3,168,000 map is a standard USGS wall map on which major water courses and cities are shown). The delineation should be performed on the 1:500,000 scale first so it may be used as a guide when determining the watershed on the 1:3,168,000 scale.
2. Enlarge the Willamette River watershed portion of the total nitrogen concentrations colored map to the 1:3,168,000 scale using a reducing/ enlarging projector such as a Lacy-Luci Visualizer, a Kail Reflecting Projector or a Map-O-Graph Projector. State outlines should be used for registration; i.e., to insure proper scale alignment of the watersheds.
3. At the enlarged scale (1:3,168,000), draw the watershed outline and total nitrogen concentration map units (Figure 1). Then using a transparent equidistant dot pattern, determine the percent of the total watershed each map unit comprises. This method is explained in the Data Collection Methods sub-section. For very small areas, transparencies of 8, 10, and 12 line/inch grids can be used with the line intersections constituting the "dots".
4. The weighting process used to compute the mean annual total nitrogen stream concentration attributable to nonpoint sources is shown in Table 1.

TABLE 1. COMPUTATION OF MEAN ANNUAL NONPOINT SOURCE TOTAL NITROGEN CONCENTRATION (mg/l) IN THE WILLAMETTE RIVER AT SALEM, OREGON

Map Unit	Map Unit Range	Mean of Range*		% of Watershed Within Map Unit		
1	≤ 0.500	0.275	x	54.2	=	0.149
2	0.501 to 0.700	0.592	x	5.3	=	0.031
4	0.901 to 1.100	0.996	x	7.0	=	0.070
6	1.401 to 1.700	1.543	x	20.1	=	0.310
7	1.701 to 2.000	1.844	x	0.7	=	0.013
8	2.001 to 3.000	2.450	x	12.7	=	0.311
						0.884

*Geometric mean (of two measures, the geometric mean is the square root of their product), unless for first or last map unit in which case average values are approximated from NES watersheds most representative of the particular map unit(s). Geographic coordinates of all NES stream sampling sites are in STORET, an EPA computer-based water quality system.



Nonpoint Source Total Nitrogen Stream Concentration Map Units in the Willamette River Watershed Upstream from Salem, Oregon

Willamette River
Salem
watershed boundary

Figure 1. An application of NES mapped nonpoint source stream nutrient concentration interpretations.

This system is also useful for areas where the predominant land use types are neither agriculture nor forest; however, close attention should be paid to the map's reliability inset relative to the location of one's subject area. The figure obtained by the first predictive method, the mathematical model, was about 25% lower than that obtained using the maps. This may be due in part to the generalized method by which land use data were estimated for use in the model or it may be that a fairly large amount of this watershed is in the cleared-unproductive land use category, a category not directly considered by the models.

SECTION IV

BACKGROUND

HISTORY AND OBJECTIVES

The initial planning for the National Eutrophication Survey (NES) visualized a detailed watershed land use study for each of the approximately 750 lakes to be done parallel to the field sampling program. The idea stemmed from a desire to better understand the relationship between lake trophic state and watershed land use. It was hoped that the "fruits" of this effort would be the development of a quick, relatively accurate method of assessing nutrient loadings to lakes based on analysis of land use in their watersheds.

The original concept pictured identification and mensuration of overall land use types through aerial photo and topographic map interpretation of the entire watershed of each lake included in the NES. For many reasons, including the unavailability of usable photo and/or map coverage for many watersheds or parts of watersheds, the original concept was considerably modified. The project finally evolved into a study of over 900 nonpoint type drainage areas associated with NES tributary sampling sites, most of which are within watersheds of lakes that have been studied by the NES.

In its final format, the basic objectives of the NES land use study were to: (1) investigate and gain a better understanding of the relationships and interrelationships between nonpoint watershed characteristics and stream nutrient levels, (2) develop a means for predicting stream nitrogen and phosphorus levels based on land use and related geographical characteristics, and (3) investigate and define possible regionalities in macro-watershed characteristics--stream nutrient level relationships and provide some accountability for these regionalities in the predictive methods. Because the project was an appendage of the massive stream and lake sampling program conducted by NES and included a large number of watersheds representing a nationwide variety of climatic and geographic conditions, it afforded a unique opportunity to view the land use--stream nutrient levels--eutrophication relationship on a national scale and to develop a predictive system/or systems to reflect geographical or regional differences.

By reason of its ties with the NES field sampling program which was accomplished in three phases, the NES land use study followed the same pattern. One hundred and thirty three drainage areas were selected for land use analysis in the area in which tributary sampling began in the summer of 1972. Three hundred and forty drainage areas were selected in the NES study area where sampling was initiated in 1973; and, in the remainder of the conterminous United States where sampling began in 1974, 455 drainage areas were defined. Figure 2 illustrates the distribution of the individual study drainage areas and the overall areas covered by each of the three phases.

Upon completion of data compilation for each of these phases, a report was to be written to present the data collected to date and to present some analyses of these data. National Eutrophication Survey Working Paper No. 25 (U. S. Environmental Protection Agency, 1974b) presented data compiled through the first phase. "The Influence of Land Use on Stream Nutrient Levels" (Omernik, 1976) presented data compiled for the first two phases. This report comprises an analysis of the entire data set.

LITERATURE

Recently with the surge of interest in the effects of nonpoint sources on water quality, numerous literature reviews and/or assessments of the state-of-the-art have been published on the relationships of watershed characteristics to NPS nitrogen and phosphorus levels in streams (Weimer, McGuire, and Gasperino, 1976; Wanielista, Yousef, and McLellon, 1977; Uttormark, Chapin, and Green, 1974; McElroy et al. 1976; U.S. Environmental Protection Agency, 1976; U.S. Environmental Protection Agency and U.S. Department of Agriculture, 1976b; Dornbush, Anderson, and Harms, 1974; Loehr, 1974; Dillon and Kirchner, 1975; Likens and Bormann, 1974; and Ryden, Syers, and Harris, 1973).

Many of the publications that have assessed the state of the art in the NPS nutrient field have also as an objective the development of methods for quantifying the relationships. One of the most recent of these was compiled by the Midwest Research Institute (McElroy et al., 1976). They based their system on the Universal Soil Loss Equation (USLE), relating NPS nutrient loadings of streams and lakes to soil erosion and sediment transport. However, application of the USLE for estimating nutrient yields appears to be beyond its original design (McDowell, 1976). Moreover, the factors employed in the nutrient loading functions part of the system (which include nutrient concentrations in soil, nutrient availability, and nutrient enrichment ratios) require data which are unavailable for much of the United States. The suggested alternatives to be used where data are unavailable, generally call for extrapolation from dated, extremely small scale maps (Parker et al., 1946) and some measured values from a few experimental, generally site-specific studies for which no theoretical approaches to broad scale prediction have been attempted (U. S. Environmental Protection Agency, 1976; Viets, 1975; Stoltenberg and White, 1953; Massey, Jackson, and Hays, 1953; and Kilmer [as cited by McElroy et al., 1976]). The USLE was designed to predict soil loss from sheet and rill erosion; it was not designed to estimate the amount of sediment entering a stream system, and it does not account for deposition within watersheds (Wischmeier, 1976). Therefore, the applicability of the USLE to areas larger than a field of a few acres, e.g., a 100 km^2 watershed with different land uses and topographical variations, is extremely questionable.

Two earlier studies that reviewed the literature on NPS nutrient relationships, as well as attempted to provide predictive procedures, were

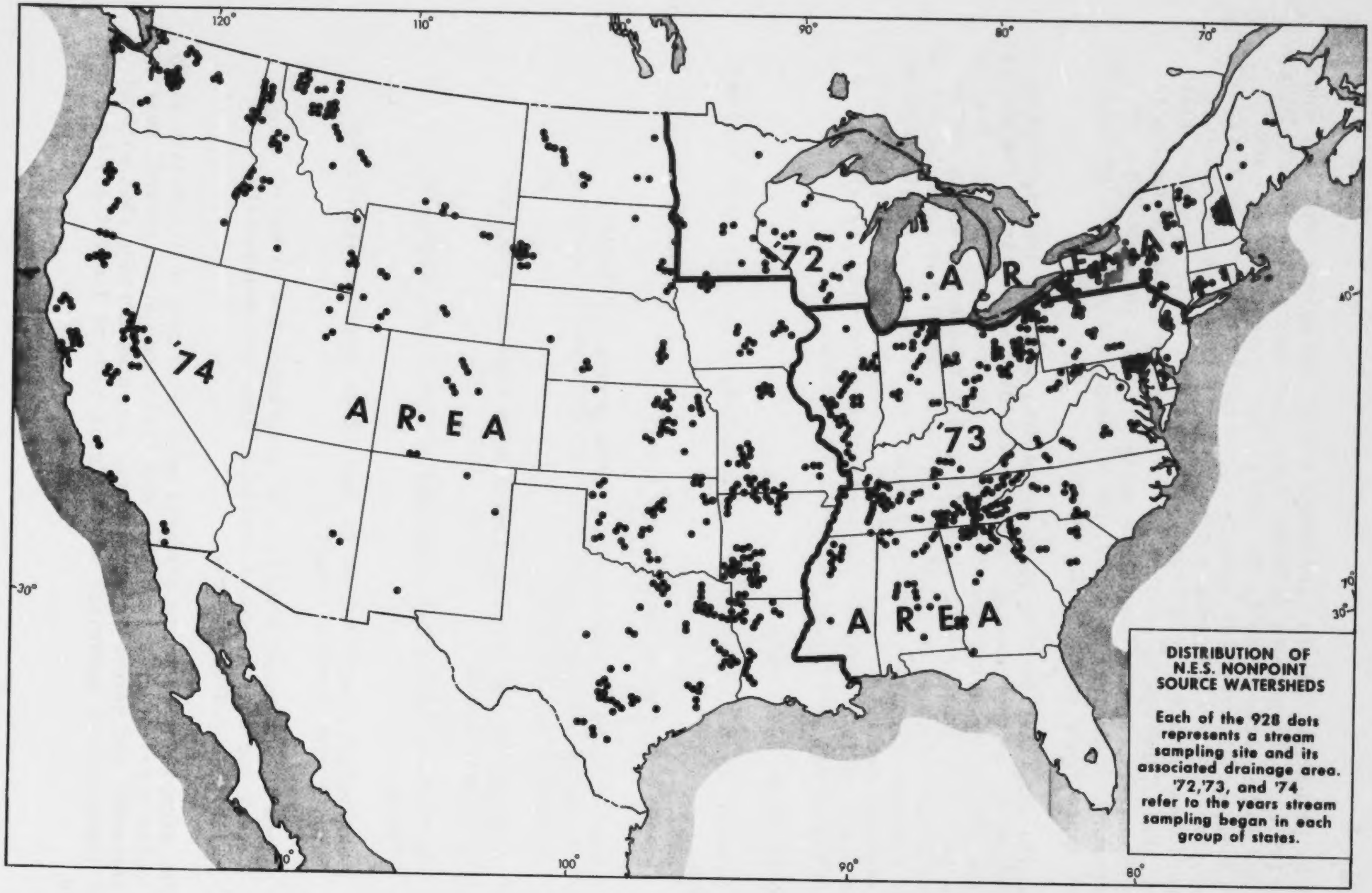

120°
110°
100°
90°
80°
70°
40°
30°
'72
'73
'74
AREA
AREA
AREA
AREA
DISTRIBUTION OF
N.E.S. NONPOINT
SOURCE WATERSHEDS
Each of the 928 dots represents a stream sampling site and its associated drainage area. '72,'73, and '74 refer to the years stream sampling began in each group of states.

Figure 2. Distribution of individual NES nonpoint source study watersheds.

published by Uttormark, Chapin, and Green (1974) and Weimer, McGuire, and Gasperino (1976). The authors gathered data from many of the investigations that, by and large, based results on information collected from a small number of drainage areas within specific geographic regions. In attempting to develop systems for estimating nutrient runoff from land use based on coefficients developed entirely from the literature, these reviewers have summarized their findings by presenting ranges of values and midpoints or averages. Generally, these ranges are quite wide and the midpoints, or other indicators of central tendency, do not vary from one land use type to another as appreciably as one might expect.

It would seem that uniformity in procedure, which is largely lacking from one study to another, would limit the validity of comparing the results of one with another or using combined results to establish nutrient loading coefficients. More importantly, there is an insufficient quantity and an inadequate distribution of data points available from literature sources to study the regional aspects of nutrient runoff or to be able to distinguish between regional and overall relationships. Examples of the latter point are shown later in this paper in the sections dealing with the effects of geology and drainage density on nutrients in streams.

SELECTION OF STUDY WATERSHEDS

In general, criteria for selecting tributary sites for study drainage areas were:

A. Absence of identifiable point sources.

B. Availability of usable aerial photography (preferably in scales of from 1:40,000 to 1:80,000) and/or existing general land-use data.

C. Availability of accurate topographic maps for drainage area delineation.

D. Sufficient relief for clear definition of drainage area limits.

E. Sufficient precipitation to facilitate sampling and provide significant surface runoff.

F. Need to encompass a variety of geographic and climatic areas and obtain, where possible, land-use homogeneity within subdrainage areas.

A few exceptions to these criteria were necessary to accomodate study of particular types of areas. Within the 1973 study area, several heavily-mined watersheds and several predominately urban watersheds (but without apparent industrial or municipal wastewater treatment facilities) have been included.

It should be noted that an overriding selection constraint was that tributary sites for study drainage areas had to be among those already selected for inclusion in the NES or had to be selected within a reasonable distance of NES lakes to accomodate sampling by the National Guard. At the time selections were being made of drainage areas within the 1972 study area, tributary sites had already been selected and the field sampling was underway. Moreover, at that time the major thrust of the Survey was on point-source impact to lakes, particularly municipal wastewater treatment plant discharges. Generally, only problem lakes were selected for study, and many of these were in watersheds having problem-type land uses. Hence, it was somewhat difficult to find drainage areas without point sources and obtain adequate coverage of all land use types.

At the time tributary sites were being selected for 1973 NES lake studies, emphasis was still on point sources. However, tributary sampling had not yet begun in several of the states which allowed selection of additional sites where their inclusion was warranted by land use homogeneity and other factors suitable for land use and nutrient runoff analyses.

Selection of tributary sites for land use study drainage areas in the 1974 area (west of the Mississippi) was made under more ideal conditions. By that time, water research mandates had been revised by passage of Public Law 92-500. These revisions resulted in a broadening of Survey objectives to include assessment of relationships of nonpoint sources to lake nutrient levels. In addition, lake selection criteria were modified to no longer include just problem lakes, but lakes representative of the full range of water quality. This presented a better balance of lake watersheds and land use types as well as lake types. In several instances where it was necessary to achieve a better geographic distribution of drainage areas or obtain a better balance of land use categories, stream sampling sites were selected outside NES lake watersheds. Figure 2, page 13, reveals a somewhat uneven areal distribution of data points. Major gaps in geographical coverage of study areas are in (1) the low lying Atlantic and Gulf coastal plains, (2) the Great Plains west of the 100th meridian, and (3) the Intermontane Basin and Range region. Selection of stream sampling sites in these areas was generally precluded because one or more of the above mentioned criteria could not be met. The most common problem in the west was intermittent stream flows resulting from aridity. In the east, the density of point sources and insufficient relief for definition of watershed boundaries were major problems.

DATA COLLECTION METHODS

Drainage Area Measurement and Land Use Identification

Following tributary site selection, individual drainage areas were delineated on U. S. Geological Survey (USGS) topographic maps and their areas were determined with a compensating polar planimeter or an electronic planimeter. General land use identifications were made using recent aerial photography and/or land use maps. Agencies or companies from which the photos or maps were obtained were:

1. U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service. (487)*
2. U. S. Department of Agriculture, Forest Service. (136)
3. National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas. (98)
4. U. S. Department of Agriculture, Soil Conservation Service. (66)
5. National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California. (49)
6. New York Land Use and Natural Resources Inventory, Cornell University, Ithaca, New York. (59)
7. U. S. Department of Interior, Geological Survey. (36)
8. State of Wisconsin, Department of Transportation. (18)
9. Mark Hurd Aerial Surveys, Inc., Minneapolis, Minnesota. (15)
10. Minnesota Land Information System, Minnesota State Planning Agency (15)
11. State of Washington, Department of Natural Resources. (10)
12. Environmental Remote Sensing Applications Laboratory, Oregon State University, Corvallis, Oregon. (9)
13. U. S. Department of Interior, Bureau of Land Management (photos obtained through Environmental Photographic Interpretation Center, EPA Warrenton, VA). (6)
14. Department of Air Force, Headquarters Rome Air Development Center, Griffiss Air Force Base, New York. (5)
15. Arizona State Highway Department. (1)
16. Cartwright Aerial Surveys, Inc., Sacramento, California. (1)

Finished land use maps were generally unavailable for most of the country at the time the study was conducted. The New York Land Use and Natural Resources Inventory and the Minnesota Land Information System comprised the only sources for usable land use maps. All the other sources listed were for aerial imagery.

Land use categories included: (1) forest, (2) cleared-unproductive, (3) rangeland, (4) agriculture, (5) urban, (6) wetland, and (7) "other"

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*The number in parenthesis following each source indicates the approximate number of study watersheds covered either completely or in part by that particular source's photos or maps.

(including barren, extractive, and open water). The land use categories roughly correspond in level of classification to Level I of the recently developed USGS Land Use Classification System (Anderson et al., 1976).

Land Use Percentage Computation

For each drainage area, percent coverage of each land use type was compiled by use of equidistant dot pattern overlays. The dot patterns were placed non-selectively over the map overlays on which land use units had been outlined. To determine the land use percentage for a given drainage area, the number of dots that fell on each land use category was totaled, each total was multiplied by 100, and the resulting products were divided by the number of dots falling in the drainage area. Dot pattern densities varied from one drainage area to another depending on the overall size of the drainage area; generally, the larger the area the less dense the dot pattern. At least 400 dots per drainage area, but for convenience preferably less than 800, were needed for a valid determination of percent coverage.

Animal Unit Density Computations

It is generally accepted that animal wastes are major contributors of the nitrogen and phosphorus in agricultural land runoff (Holt, Timmons, and Latterell, 1970; Holt, 1971; Robbins, Howells, and Kriz, 1971). Early in this study, it seemed some mechanism should be developed to analyze this aspect of agricultural runoff. Because of shifts in agricultural land use, particularly from season to season and year to year, it seemed impractical and perhaps impossible to accurately separate pasture from cropland. A more expeditious method was to determine overall animal densities (i.e., animal units per acre of subdrainage area).

For the most part, animal unit densities for each drainage area were computed from U. S. Census of Agriculture figures, other literature sources, and personal communications (Johnson and Mountney, 1969; Miner and Willrich, 1970; Miner, 1971; U.S. Department of Commerce, Bureau of Census, 1972a; Wisconsin Statistical Reporting Service, 1973; Anonymous, 1974; Arscott, 1975; Harper, 1975; Hohenboken, 1975; and Miner, 1975). The quantities of total nitrogen and total phosphorus produced annually by common farm animals were also compiled from these sources (Table 2).

TABLE 2. ANIMAL NUTRIENT PRODUCTION (kg/yr/animal)

	Total P	Total N
Cattle	17.60	57.49
Hogs	3.23	9.68
Sheep	1.47	10.06
Poultry		
Layers	0.16	0.42
Broilers	0.09	0.39
Turkeys	0.39	0.84

These data, together with Census of Agriculture figures for each county, were used to compile animal unit densities per drainage area using the following equations:

$$A_p = \frac{1}{A_c} \; \frac{D_a}{1} \; \frac{C_a + (0.184 \cdot H) + (0.084 \cdot S) + (0.0093 \cdot P_l) + (0.0011 \cdot P_b) + (0.0222 \cdot P_t)}{1}$$

and

$$A_n = \frac{1}{A_c} \; \frac{D_a}{1} \; \frac{C_a + (0.169 \cdot H) + (0.175 \cdot S) + (0.0073 \cdot P_l) + (0.0015 \cdot P_b) + (0.0147 \cdot P_t)}{1}$$

where: A_p = Animal units per square kilometer for Total P;

A_n = Animal units per square kilometer for Total N;

A_c = Total agricultural land (by county) in square kilometers;

D_a = Percent of subdrainage area in agriculture;

C_a = Total cattle and calves (by county);

H = Total hogs and pigs (by county);

S = Total sheep and lambs (by county);

P_l = Total layers (by county);

P_b = Total broilers (by county); and

P_t = Total turkeys (by county).

For drainage areas located in more than one county, weighted unit densities were determined based on the amount of agricultural land in each county. The coefficients were adjusted to reflect average animal weights relative to an average weight for cattle and calves (same sources as for Table 2). It should be noted that coefficients for poultry take into consideration average life spans and broods per year.

Geology Identification

Some recent works on NPS nutrients in streams have given as much or more emphasis to the effects of geology than to the effects of land use (Dillon and Kirchner, 1975; Thomas and Crutchfield, 1974; Stone, 1974; Betson and McMaster, 1975; and Likens and Bormann, 1974).

None of these studies approached the geology--stream nutrient level relationships subject from a national perspective. All were based on data which were completely, or for the most part, collected from one specific basin or geographical region. In addition, there appears to be little agreement as to which aspect of geology is related to stream nutrient levels. Dillon and Kirchner noted significant differences in phosphorus loads in streams from watersheds of sedimentary origin versus those of igneous origin, and that a furthur breakdown of the igneous classification to plutonic (intrusive) versus volcanic (extrusive) seemed to be important. Thomas and Crutchfield, dealing exclusively with sedimentary watersheds, concluded that the presence of medium- to high-phosphate limestone resulted in higher phosphorus and nitrogen stream concentrations than where these geologic types were absent and others such as sandstone and shale were present. Stone studied one watershed with limestone and one without limestone and concluded that this geologic characteristic was unrelated to stream phosphate concentration but that the anthropogenic aspects, such as human and animal densities and land use, were significantly related. Using these studies as a guide and with an aim of providing as many combinations of possible relationships as possible given the source materials available for the entire data set, the following general breakdown was used to classify NES study subdrainage areas:

1. Sedimentary-mixed
2. Sedimentary-mixed, without limestone
3. Sedimentary-limestone
4. Sedimentary-sandstone
5. Sedimentary-shale
6. Sedimentary-undifferentiated
7. Sedimentary-clay
8. Sedimentary-glauconite, phosphate rock, or carbonate bearing
9. Sedimentary-marine sediments
10. Sedimentary-megafossils
11. Igneous-mixed
12. Igneous-plutonic
13. Igneous-plutonic-acidic
14. Igneous-plutonic-basic
15. Igneous-volcanic
16. Igneous-volcanic-acidic
17. Igneous-volcanic-basic

18. Metamorphic-mixed

19. Metamorphic-derived from sedimentary-mixed

20. Metamorphic-derived from sedimentary-mixed without limestone

21. Metamorphic-derived from igneous

22. Metamorphic-derived from igneous-plutonic

23. Metamorphic-derived from igneous-plutonic-basic

24. Metamorphic-derived from igneous-plutonic-acidic

25. Metamorphic-derived from igneous-volcanic

26. Metamorphic-derived from igneous-volcanic-basic

27. Metamorphic-derived from igneous-volcanic-acidic

28. Mixed

29. Composition Unknown

Where drainage areas included two of the above classifications, combinations were shown with the predominant type first. Sources for these data were mostly state and federal geologic maps of varying dates and scales, although most were of individual states at scales ranging from 1:250,000 to 1:500,000.

An abreviated version of the above breakdown, based on geologic origin, was used in the earlier NES report on the eastern 473 watersheds (Omernik, 1976). In that report, it was concluded that on the basis of that particular classification scheme and the NES eastern data set, there was no apparent significant effect of geology on either phosphorus or nitrogen levels in streams. It was suggested that, insofar as phosphorus levels in streams were concerned, a more appropriate classification scheme be used based on the mineral composition of rocks rather than entirely or primarily on origin. Based largely on the data generated by Goldschmidt (1958) and Van Wazer (1961), a list of phosphorus composition percentages for the most common rock types was prepared (Table 3).

TABLE 3. TOTAL PHOSPHORUS COMPOSITIONS OF ROCK TYPES

Rock Type	Total P Composition (%)
Sedimentary	
Limestone	0.020
Sandstones	0.040
Shales	0.080
Red clay	0.140
Sedimentary-mixed (averaged)	0.070
Igneous	
Rhyolite	0.055
Granite	0.087
Andesite	0.123
Syenite	0.133
Monzonite	0.139
Diorite and Dacite	0.144
Gabbro	0.170
Basalt	0.244
Igneous rock*	0.118
Igneous-plutonic (averaged)	0.134**
Igneous-volcanic (averaged)	0.141**

*An average of the values given by Goldschmidt (1958) and Van Wazer (1961).

**Averages of values for plutonic or volcanic types given in this table. No data are available from the literature on igneous-plutonic or igneous-volcanic per se.

Using the best available geologic maps for each of the study watersheds, the major rock type, or types, were identified and their general extent computed. Then the percent of total area of each watershed underlain by each rock type was multiplied by percentage for that particular rock type (Table 3). By weighting on the basis of areal extent of each rock type, this procedure was continued until an overall phosphorus composition had been determined. Metamorphic rocks were assigned the values for rocks from which they were derived. Although information on metamorphic rocks is rather scarce compared to that available for igneous and sedimentary rocks, it appears that metamorphism produces no detectable change in the distribution of elements unless the rocks have been permeated by other materials during metamorphism (Krauskopf, 1967). Figures for sedimentary-mixed, igneous rock, igneous-plutonic and igneous-volcanic were included in Table 3 to accommodate computation of values for watersheds where source materials of more detailed levels of classification were unavailable.

Slope and Drainage Density Computations

For each drainage area, mean slope was calculated using an equidistant dot pattern overlay. Less dense patterns were used for this work than were used for computing land use percentages. For this procedure, 40 to 80 dots per drainage area were used. The overlays were placed randomly over the topographic maps on which the drainage areas had been outlined. Then, using an appropriate slope indicator, the percent of slope for the points under each dot was calculated. The data were then totaled and divided by the number of points falling in the drainage area. The slope indicators used were transparent templates indicating percent of slope from distances between map contours, adjusted for map scale and contour interval.

Average drainage densities for 291 of the study areas were computed by dividing the total length of "blue-line" streams (both perennial and intermittent) by the watershed area. For purposes of this study, drainage density is defined as total mapped stream lengths per unit area of watershed and is expressed in kilometers per square kilometer. These data were compiled through the use of an electronic planimeter capable of both linear and areal mensuration. In all cases, the most recent U.S.G.S. 1:24,000 or 1:62,000 scale topographic maps were utilized. Where both scales were available for a given area and the map compilation dates were similar, the 1:24,000 scale was chosen. Because of the time involved in determining these data, the compilations were made only for those watersheds which were in the predominantly ($\geq$90% and $\geq$75%) forested and predominantly agricultural land use categories.

Soil pH Calculations

Early in the course of this project, it was found that even a good approximation of mean surface soil pH for each of the over 900 drainage areas was not available except through time-consuming work with numerous large-scale maps from widely scattered sources and contact with local soils scientists. The time and expense prohibited this approach, at least for the present. The best alternative source was a collection of estimates of surface soil pH ranges for map units appearing on the National Atlas soils map (Smith, 1975; and U. S. Geological Survey, 1970). Each drainage area was identified with a midpoint of the pH range for the soils map unit predominant within it. The limitations of this method are covered in the discussion on nutrient runoff-soils relationships section of this report.

Precipitation

Mean annual precipitation data were compiled from National Oceanic and Atmospheric Administration (NOAA) climatological data publications. In computing these data, consideration was given to the locations of climatological data collection site(s) in relation to each of the study drainage areas, especially with regard to elevation and exposure, and adjustments were made accordingly.

Nutrient Concentration and Export Estimates

Explanations of the following procedures are given in NES Working Paper No. 1 (U. S. Environmental Protection Agency, 1974a); and NES Working Paper No. 175 (U. S. Environmental Protection Agency, 1975):

1. Tributary sampling methods and handling.
2. Analytical methods (stream samples).
3. Nutrient loading estimates.
4. Stream flow estimates.

Mean annual concentrations were computed as the arithmetic mean of all the values for a given sampling site for the year of sampling. Where mean annual values were given for a group of watersheds they represent the arithmetic mean of the arithmetic mean values for all of the data points within that group.

It should be noted that nutrient exports reported herein were computed using "normalized" flow data (long-term averages) from USGS and drainage area measurements as determined by NES. For a few tributary sampling sites where USGS did not provide flow estimates, they were calculated by NES from runoff patterns in adjacent, overlapping, or nearby areas for which USGS estimates were provided. Loadings for all drainage areas in this study were estimated according to the following equation:

$$\text{Annual Load} = (C)(F)(31{,}536)$$

where: C = Mean annual concentration in milligrams per liter, and

F = Mean normalized annual stream flow in cubic meters per second.

The factor 31,536 is used to obtain loads in kilograms per year. The annual loads were then divided by the area of their respective watershed in square kilometers.

SECTION V

RESULTS AND DISCUSSION

This section discusses the analysis of land use, other drainage area characteristics, and stream nutrient runoff data compiled for the entire set of drainage areas within all three groups of states covered by the NES. The raw data are presented in Appendix A, and the distribution of the data points (comprising the 1972, 1973 and 1974 areas) are illustrated in Figure 2 (page 13).

AREAL DISTRIBUTIONS OF DATA

After compiling the data presented in Appendix A, several types of these data were sorted into classes and plotted on maps of the United States using a graduated color scheme. It was theorized that this might aid in uncovering correlations, regional patterns, and (by comparison with maps of other macro aspects such as physiographic regions, fertilizer usage, human population densities, domestic animal densities, geology, soils, and climate) possible covariants. Maps were compiled for total P concentrations, total N concentrations, ortho-P concentrations, inorganic N concentrations, total P export, total N export, land use categories, flow per unit area per year, and mean slope. The expense of publishing these colored maps precluded their inclusion in this report. Less costly black and white versions, such as those used in the previous report on the eastern data set, do not adequately illustrate the patterns. Nevertheless, the gross patterns illustrated by the colored maps of value distributions indicate certain correlations and these are worthy of mention.

The map depicting the various overall land use categories of the study watersheds revealed what might be expected from knowledge of general land use patterns in the United States. Generally, in parts of the country where the land use is mostly agricultural, so were the study areas. Conversely, in parts of the country where the land use is mostly forested, so were the study areas. In the mixed-land use regions, such as west-central New York, south-central Kentucky and northeastern Texas, the predominant land use in the study areas varied from mostly forest to mostly agriculture, with a scattering of predominantly urban and/or cleared unproductive. Generally, it was evident that land use classifications in the NES nonpoint-source watershed data set were typical of these found in the geographical area they represent. Considering the objectives of this study this seems quite noteworthy.

The map illustrating the areal distribution of mean total phosphorus concentrations disclosed a pattern roughly similar to that of the land use map, and hence a possible correlation. Comparison of the total P and land use maps revealed several groups of drainage areas with notably lower phosphorus concentrations than might be expected from land use alone. These areas were in southwestern Missouri, east-central Maryland, Pennsylvania, and parts of central and eastern Ohio and New York (particularly the Finger Lakes area).

Two groups of drainage areas with somewhat higher phosphorus concentrations than might be expected from an association with land use were (1) the predominantly agricultural region extending from central and eastern North Dakota to southeastern Nebraska and (2) a region extending from eastern Texas through Louisiana into western Mississippi.

The map of total nitrogen concentrations also had a pattern similar to the map of land use. Some noteworthy differences were: (1) particularly high total nitrogen concentrations in the Midwest (especially the "corn belt") and the middle Atlantic region, from Maryland and Delaware through New Jersey and southwestern Connecticut; and (2) very low values in northeast Texas, western Louisiana, southwest Arkansas, and in the mixed farming areas of the central and southwestern Appalachians and Piedmont portion of the Southeast.

Examination of the areal distributions of both total P and total N export values revealed some similarities in pattern to that of land use but far less than the likenesses between nutrient concentrations and land use. The distribution maps of slope and flow (discharge/unit area) values were constructed to study the possible relationships of these factors to the differences in correlation between nutrient concentration and land use and nutrient export and land use. Analyses of these data will follow in other sections of this paper.

OVERALL LAND USE--NUTRIENT RUNOFF RELATIONSHIPS

Category Definitions

Individual drainage areas were assigned overall land use categories according to the following criteria:

1. Forest; negligible extents of other types
    a. $\geq$ 90% forest (including forested wetland)
    b. < 2% agriculture
    c. < 1% urban
    d. < 5% rangeland
2. Mostly forest; minor extents of other types
    a. $\geq$ 75% forest

   - b. < 7% agriculture
   - c. < 2% urban
   - d. < 2% rangeland
   - e. not included in ≥ 90% forest category

3. Mostly forest; major extents of other types
   - a. ≥ 50% forest
   - b. not included in ≥ 90% forest or ≥ 75% forest categories
4. Agriculture; other types negligible
   - a. ≥ 90% agriculture
   - b. < 3% urban
5. Mostly agriculture; minor extents of other types
   - a. ≥ 75% agriculture
   - b. < 7% urban
   - c. not included in ≥ 90% agriculture category
6. Mostly agriculture; major extents of other types
   - a. ≥ 50% agriculture
   - b. not included in ≥ 90% agriculture or ≥ 75% agriculture categories
7. Rangeland

   ≥ 75% rangeland
8. Mostly rangeland; remainder predominantly agriculture and/or urban
   - a. ≥ 50% rangeland
   - b. ≥ 20% agriculture and urban
   - c. not included in other mostly rangeland categories
9. Mostly rangeland; remainder largely forest, cleared unproductive, and/or wetland
   - a. ≥ 50% rangeland

b. ≥ 20% forest, cleared unproductive, and/or wetland

c. not included in other mostly rangeland categories

10. Cleared unproductive

≥ 75% cleared unproductive

11. Mostly cleared unproductive

≥ 50%, but < 75% cleared unproductive

12. Urban

≥ 40% urban

13. Mixed; not included in any other category

For ease in referencing, the categories which were differentiated from others mainly by differences in the coverage percentages of their major land uses were named after those differentiating percentages (e.g., ≥ 75% forest, ≥ 50% forest, etc).

General Analysis

The relationships between these overall land use categories and nutrient runoff are illustrated in Figures 3 and 4. It should be emphasized that these graphs represent mean annual nutrient values for all watersheds in each land use category from the entire 45 state area and do not reflect regional relationships. For example, one should not conclude from Figure 3 that total phosphorus concentrations in streams draining ≥ 50% agricultural watersheds in Vermont and New York will average about 0.085 miligrams per liter. Analysis of stream nutrient data for this geographical region indicates average values are somewhat lower. By the same token, higher concentrations are generally found in streams draining ≥ 50% agriculture watersheds in Iowa. Obviously, other interrelated factors such as agricultural practices, slope, soils, climate, etc., are important.

However, Figures 3 and 4 illustrate some significant overall land use--stream nutrient concentration relationships. Nutrient concentrations are substantially higher in streams draining agricultural lands than in streams draining forested areas. The concentrations are generally proportional to the percent of land in agricultural use. Both total phosphorus and total nitrogen concentrations are roughly nine times higher in streams draining predominantly agricultural (≥90% agriculture) watersheds than in streams draining predominantly forested (≥90% forest) watersheds. However, ignoring the land use categories represented by small data sets (N < 50), the rate of increase in nutrient concentration with increased amounts of agricultural land usage appears to be more constant with regard to phosphorus than nitrogen. Over half of the nine-fold difference in total nitrogen concentration occurs as agricultural use increases from at least 75% of the land area to 90% of the land area.

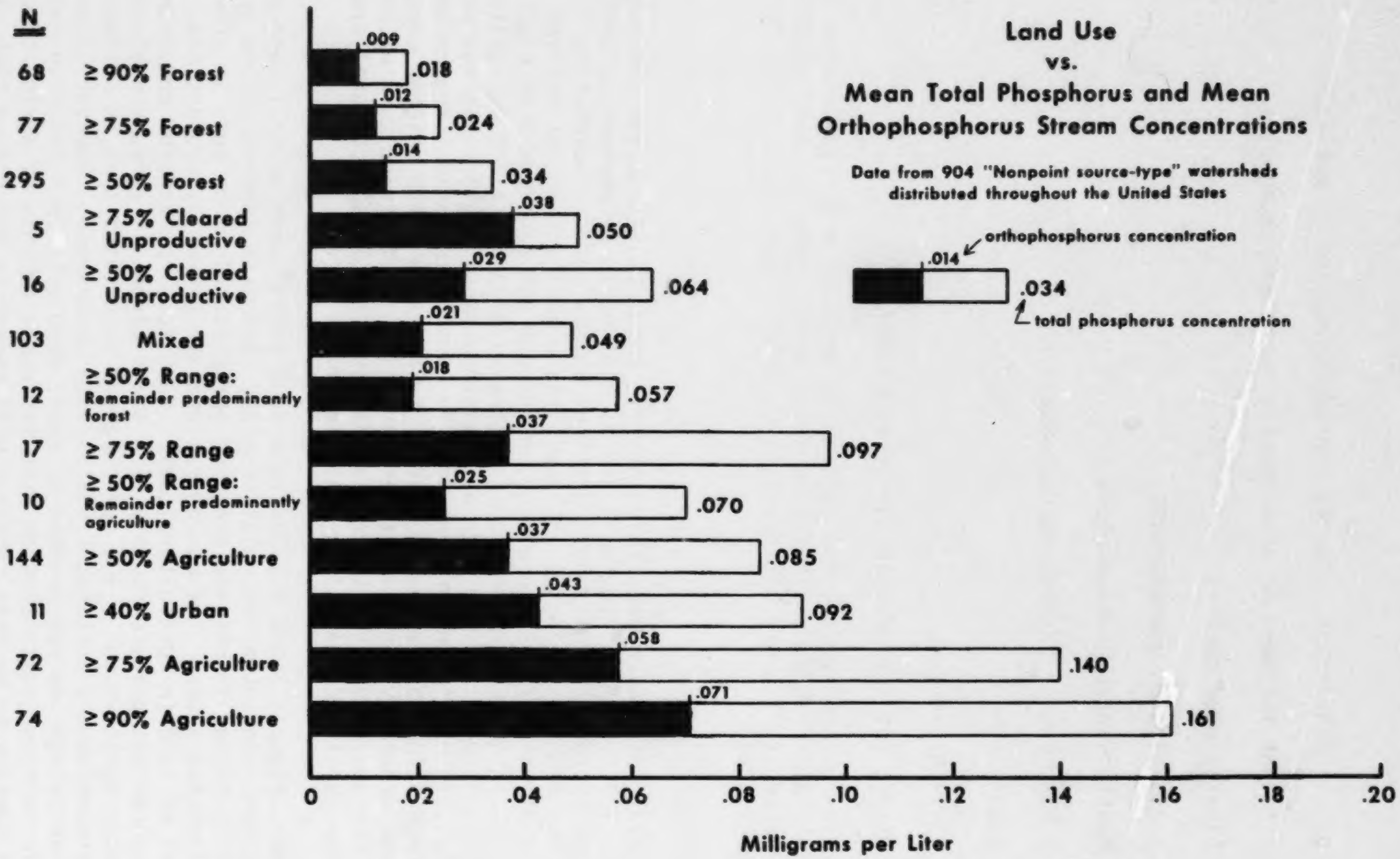

Figure 3. Relationships between general land use and total phosphorus and orthophosphorus concentrations in streams.

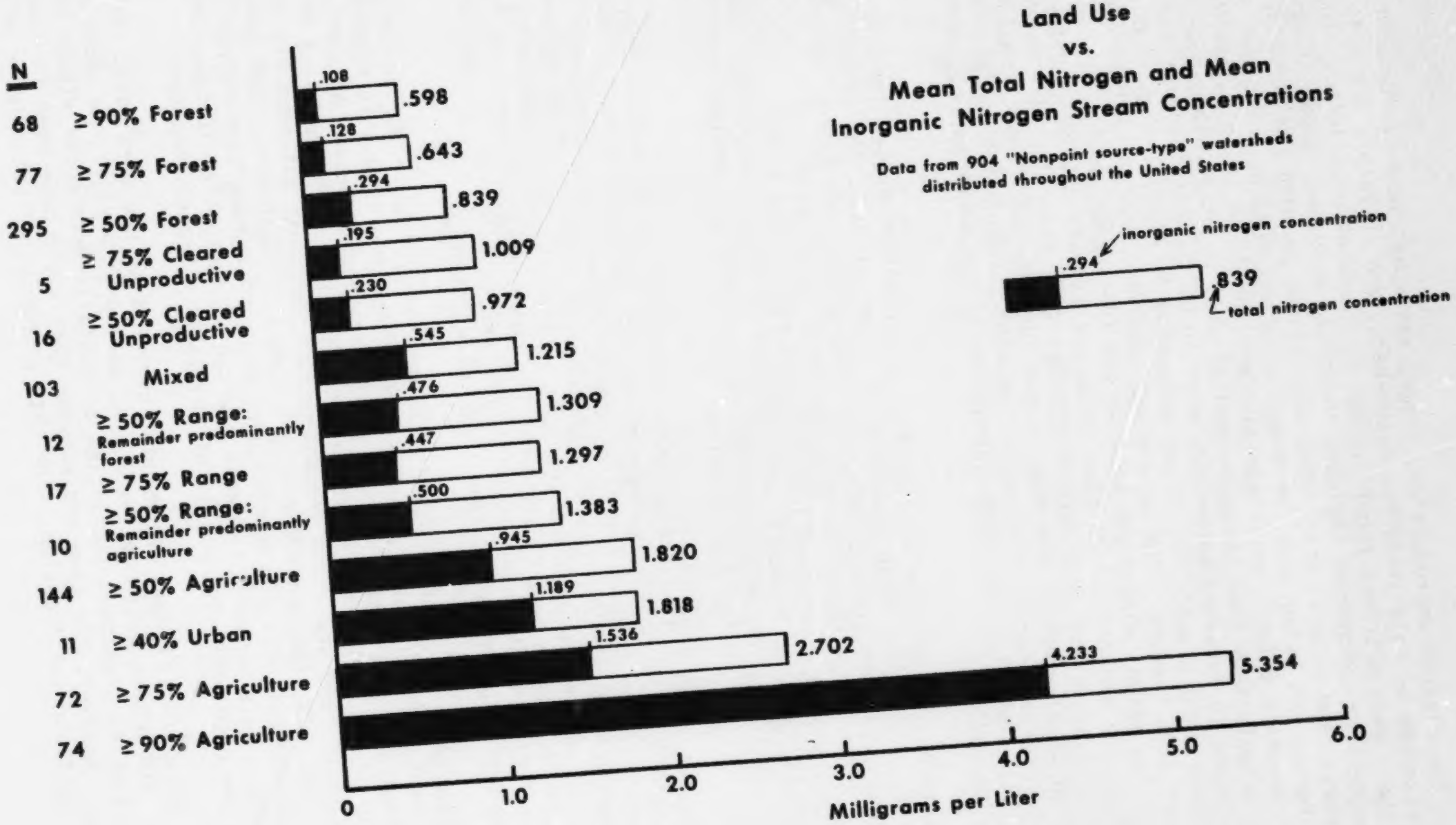

Figure 4. Relationships between general land use and total nitrogen and inorganic nitrogen concentrations in streams.

The cleared unproductive, range, and urban land use categories were represented by relatively few watersheds, and therefore the interpretation of their mean nutrient runoff values is somewhat restricted. The cleared unproductive categories included abandoned farmland, areas of recent timber harvests, and natural grasslands and savanna or open low scrubland which was apparently not being used for domestic animal grazing. One would expect the anthropogenic effects on stream nutrient levels in these watersheds to be considerably less than those in agricultural or urban watersheds but greater than those in forested watersheds because of the possible residual effects of former land usage. The values presented in Figures 3 and 4 do, in fact, support this thought. The mean annual nutrient concentrations for the range categories reveal what might be expected from range land usage. The concentrations are generally less than those for streams draining mostly agricultural watersheds but considerably greater than those for streams draining forested areas. Oddly, the mean values for the $\geq$50% range; remainder largely forest, cleared unproductive and/or wetland category are not significantly lower than the other two range categories as one might expect, particularly regarding nitrogen.

Interestingly, based on the mean concentration values for the nationwide data set, phosphorus would generally be expected to be the limiting nutrient for algal growth in surface water draining either forested or agricultural areas. The total nitrogen to total phosphorus ratios are 33:1, 27:1, 25:1, 21:1, 19:1 and 33:1 for $\geq$90% forest, $\geq$75 forest, $\geq$50% forest, mixed, $\geq$50% agriculture, $\geq$75% agriculture, and $\geq$90% agriculture watersheds, respectively. Generally phosphorus is considered the limiting nutrient when the N:P ratio is 15:1 or greater (Vollenweider, 1968).

Figures 3 and 4 also reveal some interesting relationships regarding the inorganic forms (commonly regarded as the available forms) of both nutrients. Figure 3 shows the relationships between orthophosphorus (PO_4 as P; technically, soluble reactive phosphorus) concentrations and overall land use categories to be about the same as those between total phosphorus (as P) and land use. Mean orthophosphorus concentrations comprised from 41 to 50% of the mean total phosphorus regardless of land use, except for land use categories represented by fewer than 20 watersheds.

In comparing the mean inorganic nitrogen ($NH_3 + NO_2 + NO_3$) values with those of mean total nitrogen (total Kjeldahl--N + $NO_2 + NO_3$) in Figure 4, one can see that mean inorganic nitrogen concentrations represent an increasing percentage of the mean total nitrogen concentrations with increased amounts of agricultural land use. The percentages of inorganic nitrogen are 18%, 20%, 35%, 45%, 52%, 56% and 79% for $\geq$90% forest, >75% forest, $\geq$50% forest, mixed, $\geq$50% agriculture, 75% agriculture, and $\geq$90% agriculture categories, respectively. This probably reflects the use of inorganic nitrogen fertilizers and the high water solubility of inorganic nitrogen compounds.

Mean inorganic nitrogen represented over 65% of the mean total nitrogen in the 11, $\geq$40% urban, drainage areas. As mentioned earlier, no industrial or municipal waste treatment facilities or outfalls were known within these urban areas. However, the time and expense that would have been involved did not allow field verification. The data probably reflect effects of runoff from streets and lawns and, to some extent, the effects of septic tanks.

It should be noted at this point that the data set used for analyses involving nutrient concentrations numbers 24 less (total = 904) than that used for analyses involving nutrient exports. It was felt that omitted watersheds had too few samples, due to low or no flow most of the year, to reflect mean annual concentrations relative to those watersheds from which samples were collected most or all of the sampling year. However, because the dry periods that caused the insufficient flow were generally typical of the particular areas involved and because flow is generally more significant than concentration in determining export, the 24 watersheds were included in the analysis of stream nutrient export--nonpoint source relationships.

The nutrient exports per unit area of watershed for both forms of phosphorus and nitrogen are shown in Figures 5 and 6. These data indicate that the differences in export from different land use categories are considerably less pronounced than the differences in nutrient concentrations. Total phosphorus export was only 2.9 times greater from predominantly agricultural (≥90% agriculture) land than from predominantly forested (≥90% forest) lands, and total nitrogen was only 2.8 times greater. Regarding the inorganic forms, orthophosphorus export from agricultural watersheds was 2.3 times greater than from forested watersheds, whereas the difference in inorganic nitrogen export was over 13-fold. For sake of comparison, inorganic nitrogen concentrations were, on the average, 39 times greater in streams draining ≥90% agriculture watersheds than they were in streams draining ≥90% forest areas. Partial explanation of the difference in the relationships of concentrations to land use and export to land use apparently lies in the differences in stream discharge (average flow per unit area per year) between agricultural lands and forested, or previously forested, lands. When the entire data set was considered, regression analysis of discharge to the percent of land in forest plus the percent of land in cleared unproductive revealed a relatively low correlation (r = 0.32). However, when the data were grouped by region, the correlations were higher for two of the regions which together comprise 77% of the study watersheds. For the east, the correlation coefficient was 0.63; for the plains, 0.59; and for the west, 0.28 (for areal definition of these regions see the insert in Figure 23.) The reason for the low correlation in the west as well as the entire data set may be due to a masking caused by the several severely dissected and/or mountainous, relatively arid, forested watersheds in the west. Possibly the higher correlations between forested and previously forested land usage and stream discharge were due to greater slopes and thinner soils in the forested areas as opposed to the agricultural areas. The correlation coefficient between mean slope and percent of drainage area in forest plus cleared unproductive was 0.61. For the eastern region the correlation was 0.63; for the plains, 0.49; and for the west, 0.54. One would expect direct surface runoff to increase with increased slope but not average annual stream discharge as was shown with these data; therefore, one or more covariants seem probable.

Some additional explanation of the difference between relationships of nutrient concentrations to land use and nutrient export to land use may be

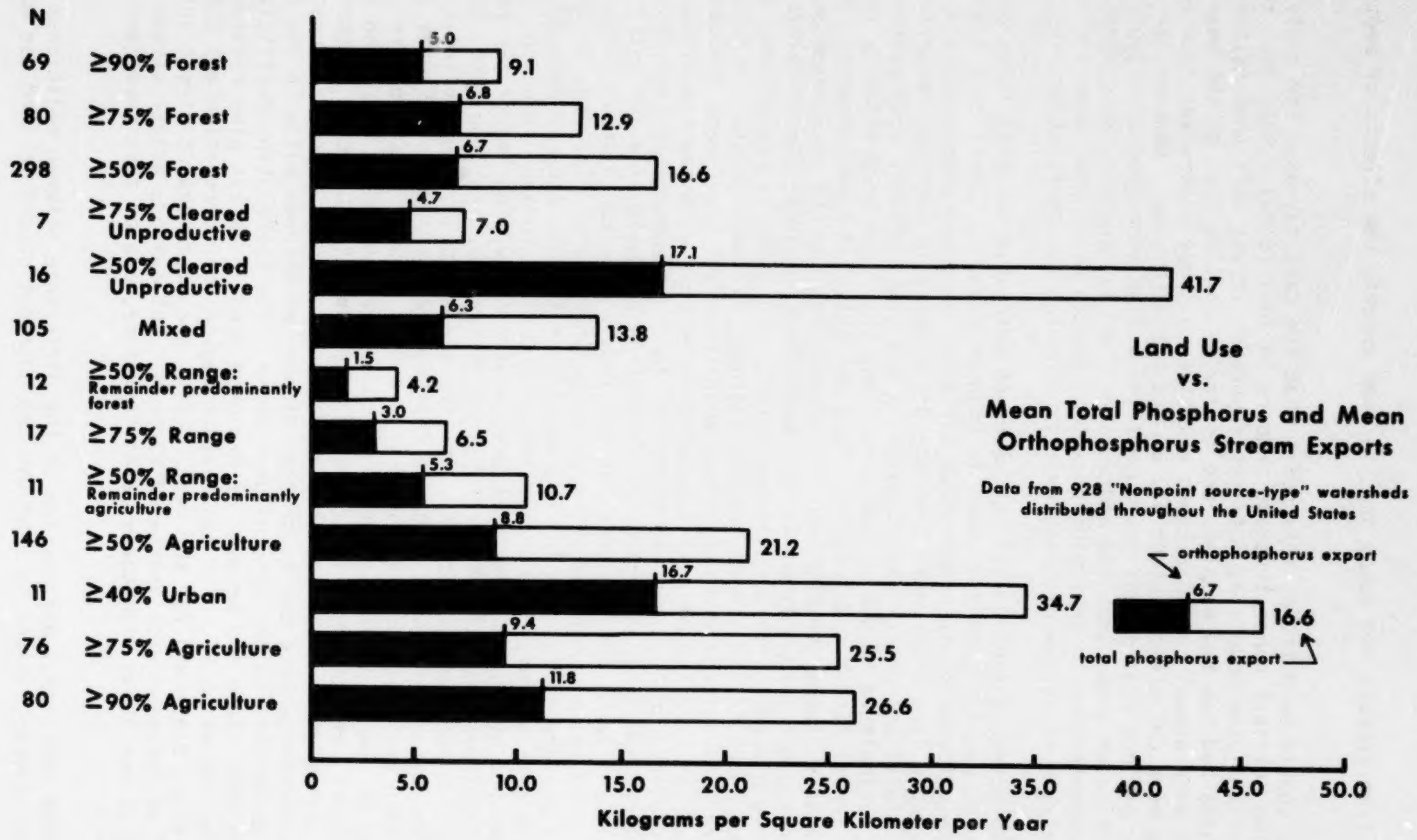

Figure 5. Relationships between general land use and stream exports of total phosphorus and orthophosphorus.

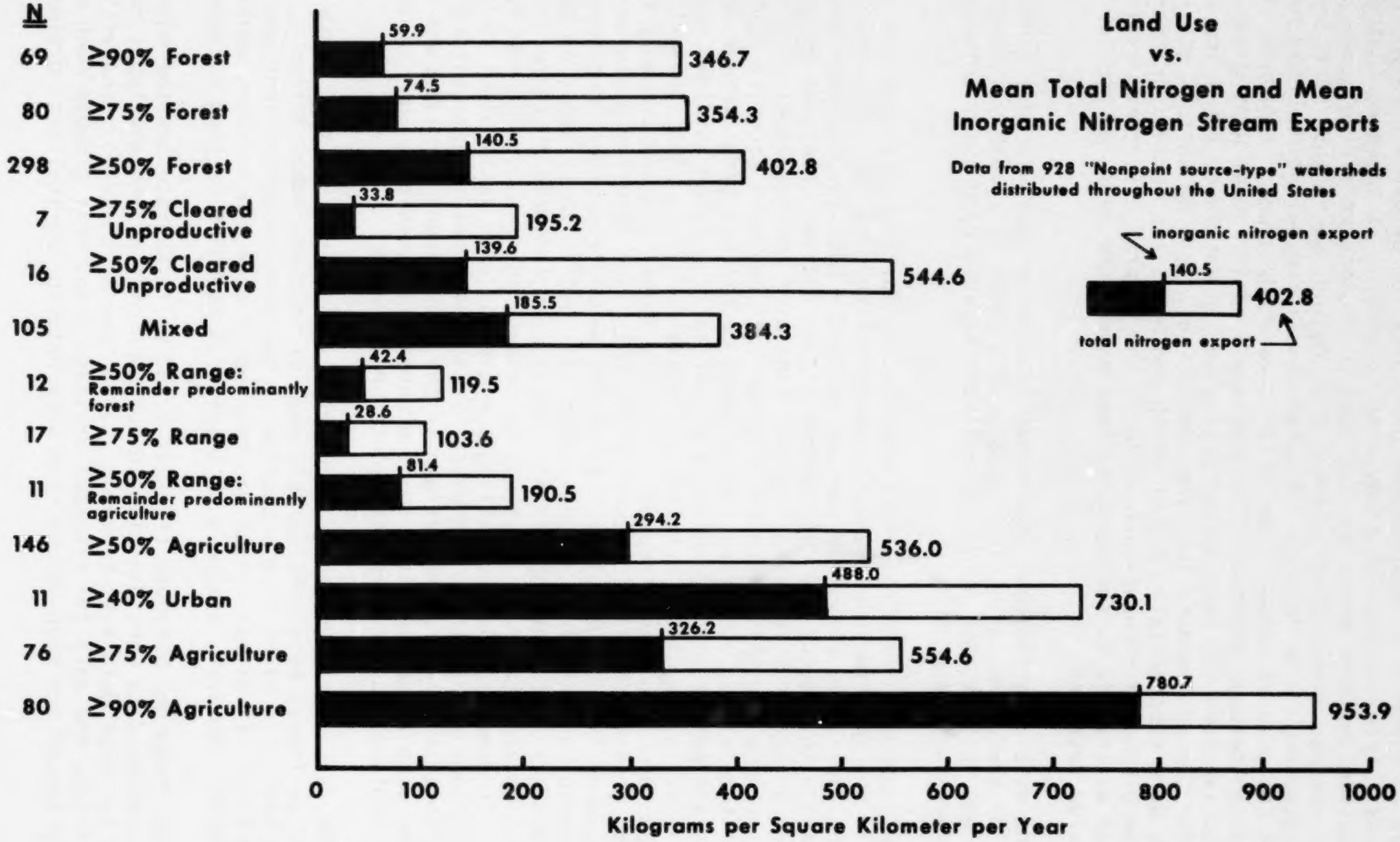

Figure 6. Relationships between general land use and stream exports of total nitrogen and inorganic nitrogen.

found in differences in mean annual precipitation patterns of study area locations. From analysis of study area locations, it appeared that most of the forested drainage areas were located in regions receiving somewhat greater average annual precipitation than regions where most of the agricultural watersheds were located. Greater annual precipitation would help explain the greater stream flow in forested study areas. Although the correlation between percent of subdrainage area in forest plus cleared unproductive land and mean annual precipitation was found to be low (r = 0.29) for the entire data set, the coefficients for the eastern and plains regions were substantially higher (0.56 and 0.73, respectively). Here, as with the discharge--forest correlations, the several dissected, semi-arid, forested watersheds in the west may have masked the relationship for the nationwide data set.

The data also indicate that urban land usage seems to have a pronounced effect on the amount of export. Again, the cause is probably increased flow rates, but in this case it was more likely because of greater areas of impervious surfaces.

In connection with the above explanation for understanding the differences in the relationships between concentrations and land use, and export and land use, it is very important to recognize that the drainage areas included in this study are not control plots. Rather, they are existing drainage areas which represent typical land use- and geographically-related characteristics in their respective areas. If one were studying control plots, where slope, soil type, and climate conditions were similar from one plot to another, one would expect a significantly higher nutrient export rate (as well as a higher nutrient concentration) from plots in agricultural land use than from forested plots. Runoff, as well, would probably be somewhat greater from agricultural plots than from forested plots because of less biomass in the agricultural areas and hence less water lost through evapotranspiration. The drainage areas included in this study, on the other hand, possess different topographic, soils, and climatic characteristics. These characteristics are important in determining land use in the first place. In general, flat to rolling terrain and rich soils, such as are found in Iowa and southern Minnesota, lend themselves to agricultural land use. Conversely, where the terrain is too mountainous or dissected or the soil too poor for agriculture to be economically feasible, such as in much of New England, forests are allowed to predominate.

The fact that study subdrainage area sizes vary, and that those categorized as forest were considerably smaller than any other category, suggested that size might have a bearing on nutrient concentrations and/or stream flow. If either factor was related to size, then export would also be related. However, analysis of these data revealed no good correlations.

The frequency polygons (Figures 7 and 8) illustrate how the nutrient concentration data were distributed for each of the land use types represented by large data sets (n >50). Comparison of these polygons with Figures 3 and 4 show the data for forested drainage areas were grouped much more tightly around the mean values than were data for agricultural drainage

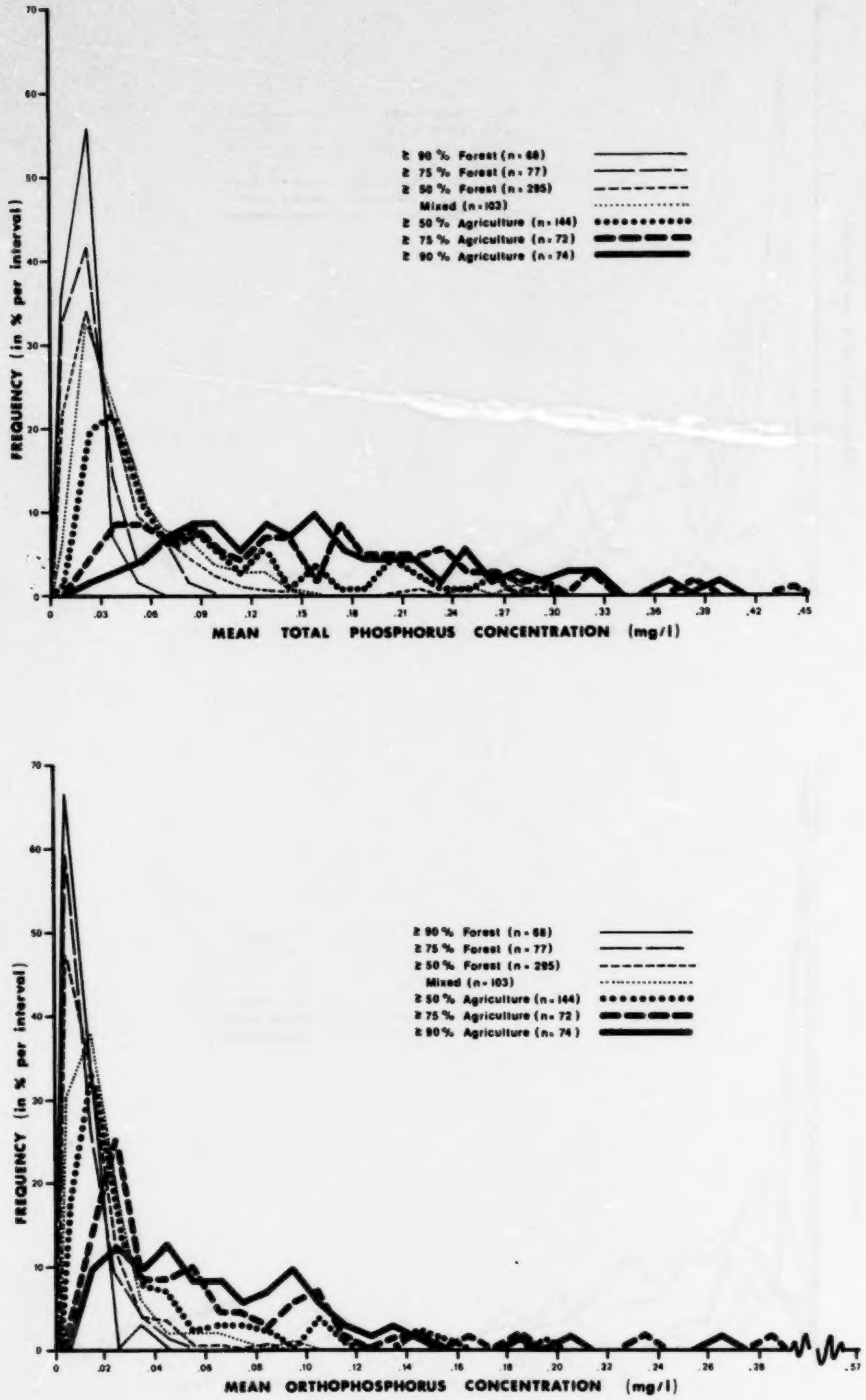

Figure 7. Frequency polygons of mean total phosphorus and mean orthophosphorus concentrations in streams by overall land use category.

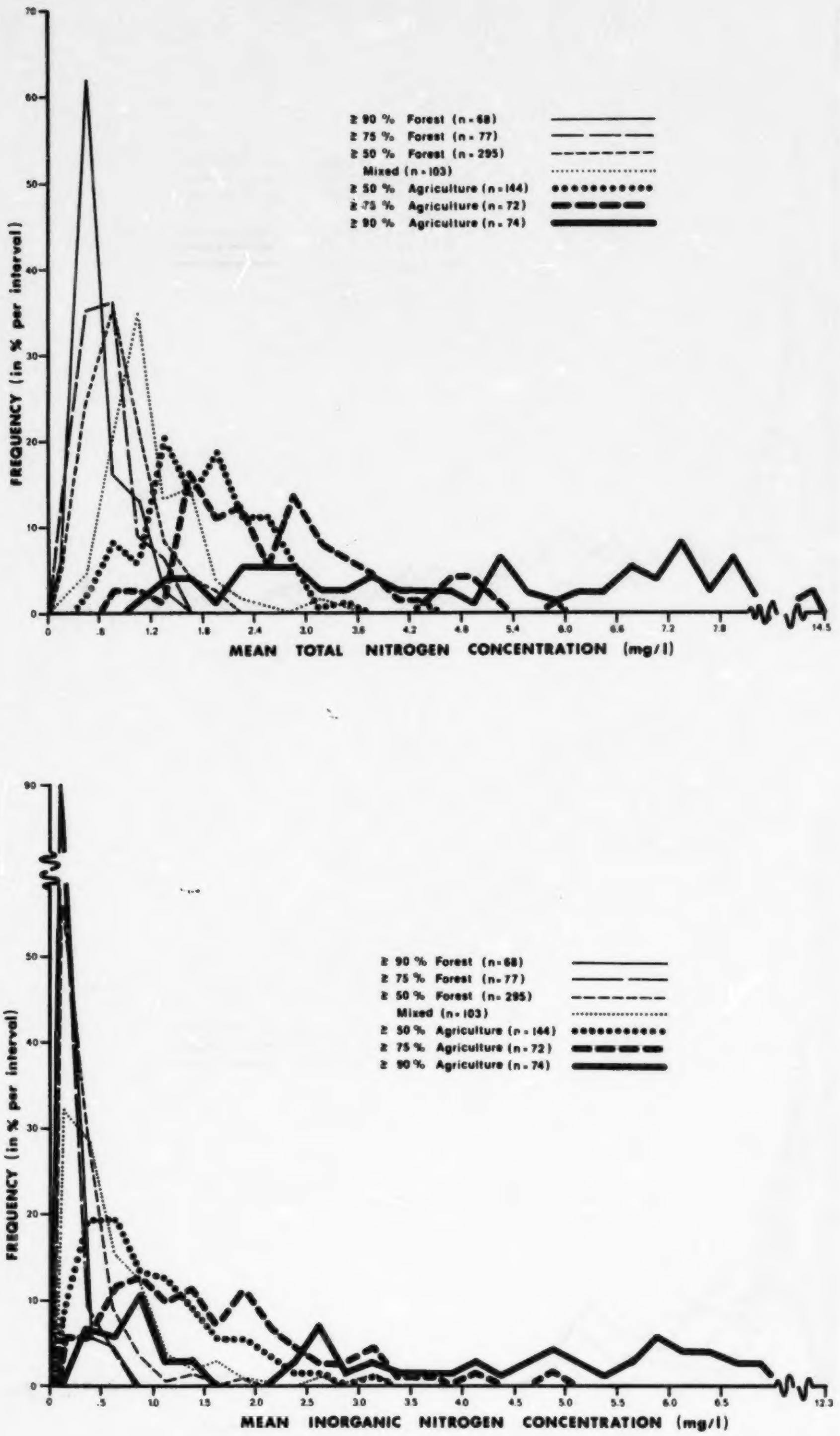

Figure 8. Frequency polygons of mean total nitrogen and mean inorganic nitrogen concentrations in streams by overall land use category.

areas. It appears that the greater the percent of land in forest the lower the mean nutrient concentration and the less the variability about the mean.

Regionality

To refine the relationships of land use to nutrient runoff shown by the bar graphs and frequency polygons, and particularly to explain some of the variations about the mean for each land use category, regional analyses employing both statistical and cartographic techniques were performed. The analyses will be discussed later, but it is important to mention at this point the part this method played in focusing on possible regionalities of relationships. The statistical analyses indicated that, after the variation in nutrient level related to general land use was explained with regard to the entire data set, the importance of each of the other macro-watershed characteristics being considered (animal unit density, mean slope, drainage density, mean annual precipitation, geology-origin, surface soil pH, and mean annual stream discharge rate) was either highly questionable or nonexistent. When the data were analyzed by region, land use remained very important but the other characteristics varied in importance; i.e., a given characteristic which did not correlate well with nutrient levels when the set was taken as a whole or by region for some regions, might correlate well in other regions.

Cartographic techniques, on the other hand, revealed more concerning the variations about the mean. They illustrated regional patterns in the relationships and interrelationships between all of the macro-watershed factors and stream nutrient concentrations. By studying these patterns one can gain an insight about which man-induced and natural characteristics may be important in specific geographic areas.

A first attempt at understanding the general nature of these regionalities involved further defining, by region, the individual land use categories shown in Figures 3 and 4. The regional delimitations used for these analyses (Figures 9 and 10) and the regression analyses mentioned earlier were based primarily on patterns evidenced by the maps commented on in the "Areal Distributions of Data" portion of this section (pages 24-25).

Figure 9 indicates that both total phosphorus and orthophosphorus NPS concentrations in streams generally are higher in the western region of the United States than in the east. The graph also illustrates that for a given land use category in the central region, phosphorus concentrations in streams are generally lower than those in the west but are higher than those in the east. This relationship appears to be the clearest with regard to forested watersheds (in the ≥75% forest and ≥90% forest categories) where total P and ortho-P concentrations are about twice as high in the west as in the east. The relationship does not appear to be quite as well defined with regard to agricultural watersheds (in the ≥75% agriculture and ≥90% agriculture categories) because of the small sample size in the western region.

The data presented in Figure 10 illustrate general regionalities for NPS nitrogen concentrations that are considerably different than those for phosphorus. Some of the noteworthy regionalities these data suggest are:

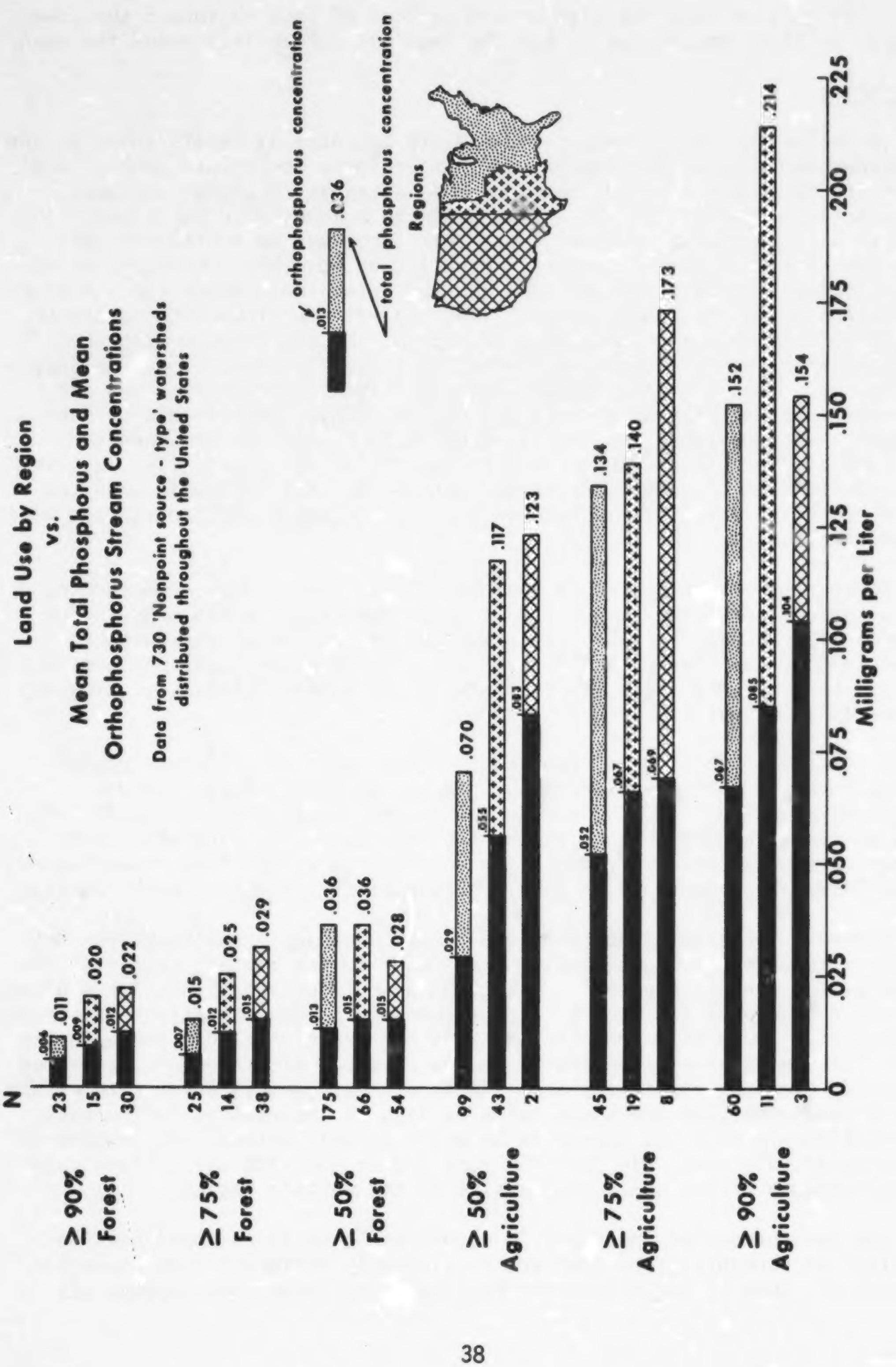

Figure 9. Regional relationships between general land use and total phosphorus and orthophosphorus concentrations in streams.

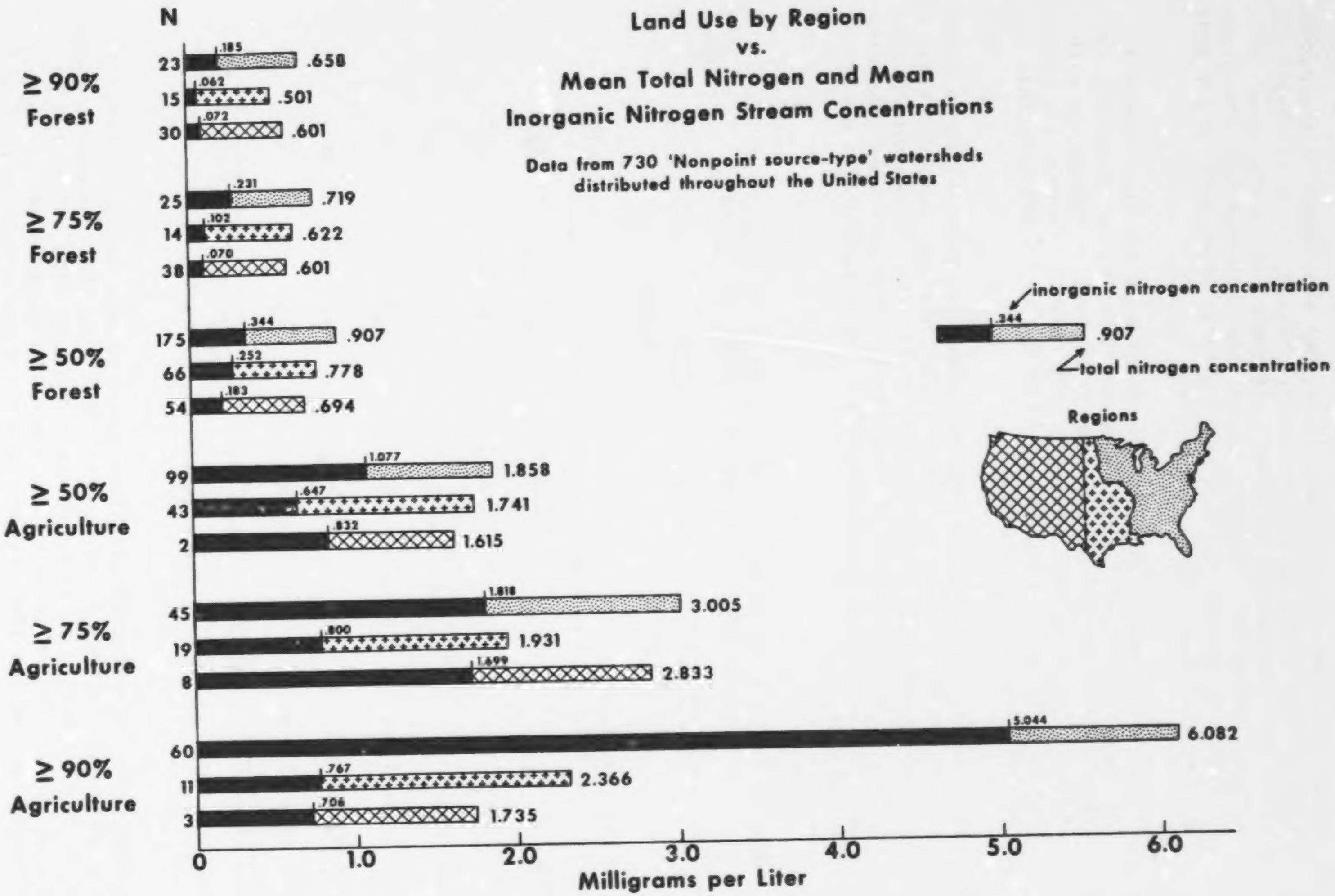

Figure 10. Regional relationships between general land use and total nitrogen and inorganic nitrogen concentrations in streams.

1. Total nitrogen concentrations in streams are higher in the eastern region than in the central or western regions. The difference is slight with respect to forested watersheds but fairly large for agricultural areas. However, as was the case with the data shown in Figure 9, the small set of agricultural watersheds in the west qualify this analysis to some degree.

2. Inorganic nitrogen concentrations in streams are much higher in the east than in the central or western regions particularly for forested drainage areas. For the watersheds in categories with the most forest (>75% forest and >90% forest), inorganic N concentrations are between 2.3 to 3.3 times higher in the east than in the remainder of the country.

3. Associated with the above regionalities, inorganic nitrogen generally makes up a higher percent of total nitrogen concentrations in streams in the east than elsewhere within the conterminous United States. The differences are especially noticeable when comparing data for forest land use categories. These percentages are given in Table 4.

TABLE 4. PERCENT OF MEAN INORGANIC NITROGEN TO MEAN TOTAL NITROGEN CONCENTRATIONS IN STREAMS BY REGION

	Regions		
Land Use Category	East	Central	West
$\geq$90% Forest	28	12	12
$\geq$75% Forest	32	16	12
$\geq$50% Forest	38	33	26
$\geq$50% Agriculture	58	37	*
$\geq$75% Agriculture	60	41	60
$\geq$90% Agriculture	82	32	*

*insufficient data points for adequate representation

Earlier, an interpretation was given based on mean values for the nationwide data set (Figures 3 and 4) which indicated that phosphorus would be expected to be limiting in surface waters draining either forested or agricultural lands. The regional values shown in Figures 9 and 10 suggest that nitrogen might be the limiting nutrient for algal growth in much of the agricultural parts of central and western United States. For the central region (for regional definitions see Figure 23, page 64) total nitrogen to total phosphorus ratios were 15:1, 14:1 and 11:1 for ≥50% agriculture, ≥75% agriculture, and ≥90% agriculture. The ratios were 13:1, 16:1, and 11:1 for ≥50% agriculture, ≥75% agriculture, and ≥90% agriculture watersheds in the western region respectively. Again, the values for agricultural categories in the western region are questionable because of the small sample size in that region. The N:P ratios derived from Figures 9 and 10 greatly exceeded 15:1 for forested categories in all three regions and for agricultural categories in the eastern region, which includes the "corn belt".

Another method for attempting to understand more about the varability about the mean values shown in Figures 3 and 4 was to cartographically present the individual values for a given land use category or group of categories for a given nutrient form that were within the highest third, middle third, and lowest third of values for that particular data set (Figures 11 through 18). This method, in effect holds land use constant and graphically displays the possible regionalities relative to the geographical locations of the study watersheds which the data represent. Maps were compiled for both forested and agricultural categories for each form of each nutrient. Data for agricultural watersheds included those from the ≥90% agricultural and ≥75% agricultural categories. Maps showing data for forested watersheds included values from watersheds in ≥90% forest and ≥75% forest categories. The low, middle, and high ranges of concentrations for seven of the eight maps were determined by studying frequency distributions of the concentrations and making divisions at logical, "even" points near the one-third and two-thirds points. For one map (Figure 17), the range of concentrations was divided into four parts because of a special interest in these data and some peculiarities noticed in previous analysis.

The data presented in Figure 11 reveal that mean annual total phosphorus concentrations in streams draining mostly forested watersheds were consistently higher in the west and south central regions of the United States than in the east. Generally, only in streams draining western high elevation- or National Park-watersheds were the phosphorus concentrations as low as those observed in the forested eastern watersheds. Interestingly, the characteristics the watersheds with low concentrations had in common that the ones with high concentrations did not was a low density of domestic animals (U. S. Department of Agriculture, Forest Service, 1972). Even for watersheds with mixed land usage (but holding the mixture constant), there were generally higher phosphorus concentrations in the west than in the east.

Figure 12 reflects regionalities of total phosphorus concentrations in NES sampled streams draining agricultural watersheds. The map reveals an area of data points having relatively high mean annual values extending from North Dakota through eastern South Dakota and eastern Nebraska as well as into central Iowa and parts of southern Minnesota. For the remainder of the agricultural watersheds in states south of this region, the total phosphorus concentrations are generally much lower. Another significant grouping appears in the east central part of the "corn belt", from central Illinois into central and northern Indiana, where the mean annual total P concentra-

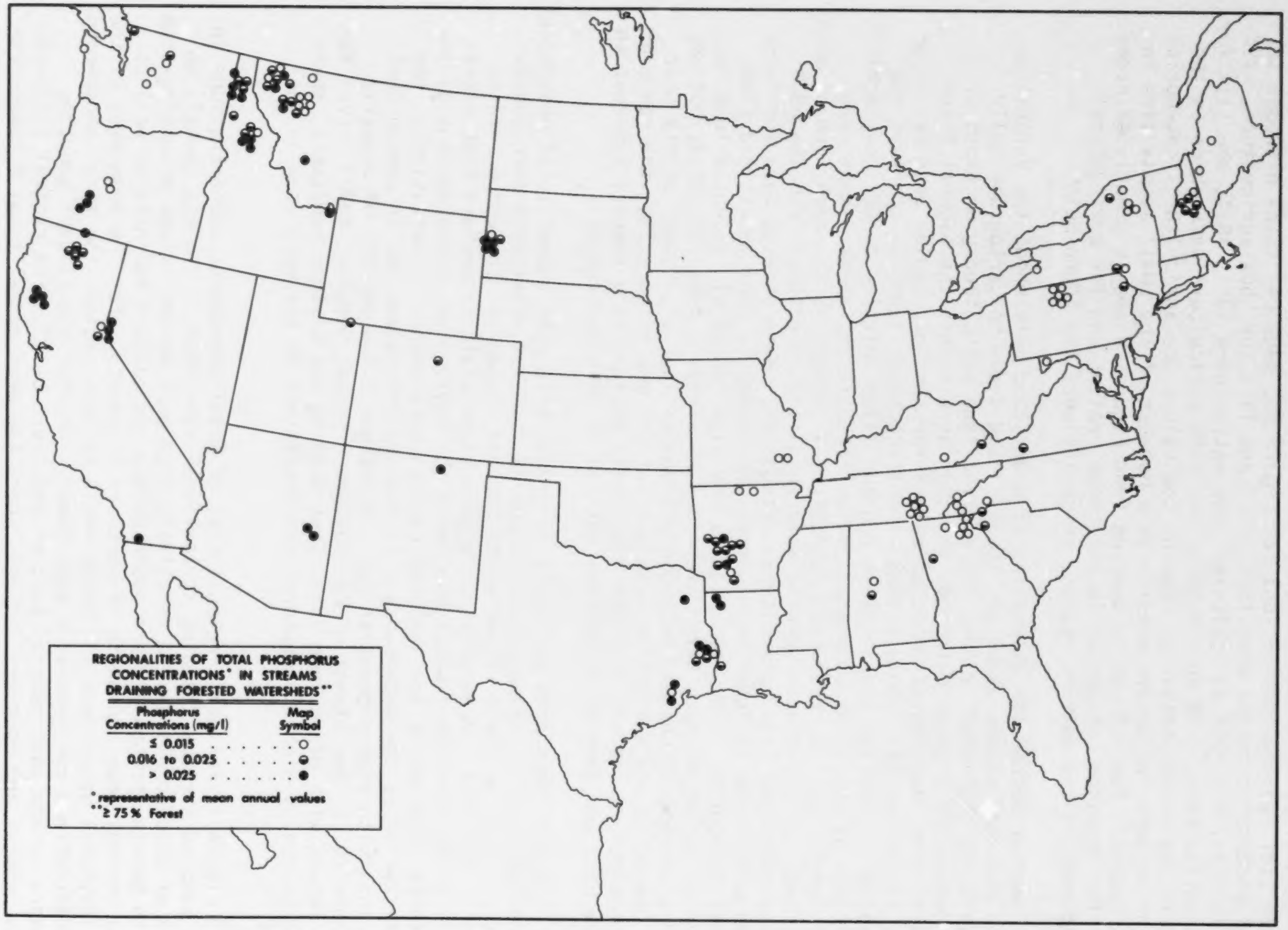
REGIONALITIES OF TOTAL PHOSPHORUS CONCENTRATIONS* IN STREAMS DRAINING FORESTED WATERSHEDS**
Phosphorus Concentrations (mg/l)
Map Symbol
≤ 0.015 . . . . . . ○
0.016 to 0.025 . . . . . ◒
> 0.025 . . . . . . ●
*representative of mean annual values
**≥ 75% Forest

Figure 11. Regionalities of total phosphorus concentrations in NES sampled streams draining forested watersheds.

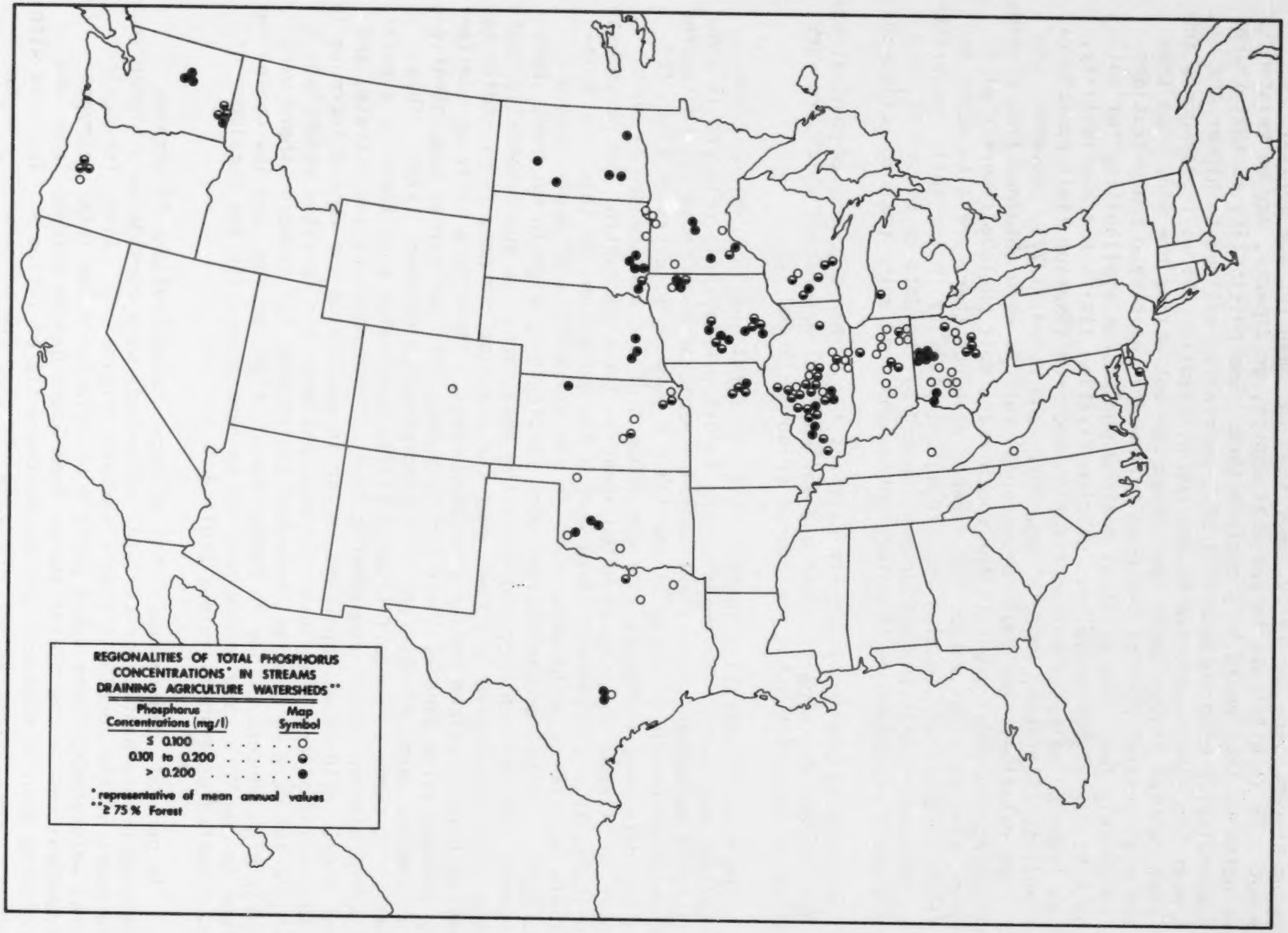
REGIONALITIES OF TOTAL PHOSPHORUS CONCENTRATIONS* IN STREAMS DRAINING AGRICULTURE WATERSHEDS**
Phosphorus Concentrations (mg/l)
Map Symbol
≤ 0.100 ○
0.101 to 0.200 ◒
> 0.200 ●
*representative of mean annual values
**≥ 75 % Forest

Figure 12. Regionalities of total phosphorus concentrations in NES sampled streams draining agricultural watersheds.

tions in streams were generally lower than the mean for the agricultural data set. It is difficult to see what aspect, or aspects, may be related to these patterns that would help explain them. One possibility is that there is a correlation with surface soil pH. Generally, soil pH is higher and more near the level conducive to maximum availability of soil phosphorus in the west central states where the stream concentrations are very high than in the east-central part of the corn belt where the stream concentrations are relatively low. The point of maximum phosphorus availability for soils is pH 6.5; at higher pH values, calcium fixation limits the availability, and at lower pH values aluminum fixation and iron fixation limit phosphorus availability (Scarseth, 1962; Kling, 1977; and Moore, 1977). However, the fact that relatively low phosphorus concentrations were obtained from streams draining agricultural areas to the south where soil pH levels were similar suggests that pH might not be the answer, although there are also north to south differences in leaching and biological activity in the soil. Nevertheless, it appears that the patterns evidenced by the data on Figure 12, are more closely associated with natural phenomena than anthropogenic activities.

Figures 13 and 14 illustrate patterns for orthophosphorus concentrations in NES streams draining forested and agricultural watersheds which are very similar to those for total phosphorus (Figures 11 and 12).

The maps illustrating regionalities of total and inorganic nitrogen concentrations in NES streams draining forested watersheds (Figures 15 and 16), revealed markedly different regional patterns than those for phosphorus and orthophosphorus (Figures 11 and 13). Figure 16 illustrates that, for the NES data set, inorganic nitrogen concentrations were generally much higher in streams draining forested areas in the east central and northeastern states than elsewhere. There were a few exceptions to this, the most notable was the group of watersheds in the Black Hills of South Dakota. Inorganic nitrogen concentrations were particularly high in New York, Pennsylvania, and western Maryland. For the most part, the characteristic that these high values have in common that the low ones did not, is proximity to heavily industrialized and/or populated areas. There is a striking similarity between value maps of these NES inorganic nitrogen stream concentrations and isometric maps of observed acid precipitation (Likens, 1975). This similarily tends to support Liken's (1975) conclusion that there is a relationship between annual atmospheric input of hydrogen ion and nitrate, and that nitric acid is an important factor in explaining the recent increase in acid precipitation. The total nitrogen patterns for forested watersheds (Figure 15) were by contrast somewhat indistinct; for example, there were mostly high concentrations in Pennsylvania; high, medium, and low concentrations in New York; and medium and low concentrations for the remainder of the forested watersheds in New England.

In general, mean annual total nitrogen concentrations in streams draining predominantly agricultural watersheds were considerably higher in the heart of the corn belt than elsewhere (Figure 17). Also, for agricultural watersheds, there was a pattern of relatively low total nitrogen concentrations in the plains states from South Dakota through Texas and including much of Missouri and the southern tip of Illinois. The area with high nitrogen concentrations in streams is also one of generally higher

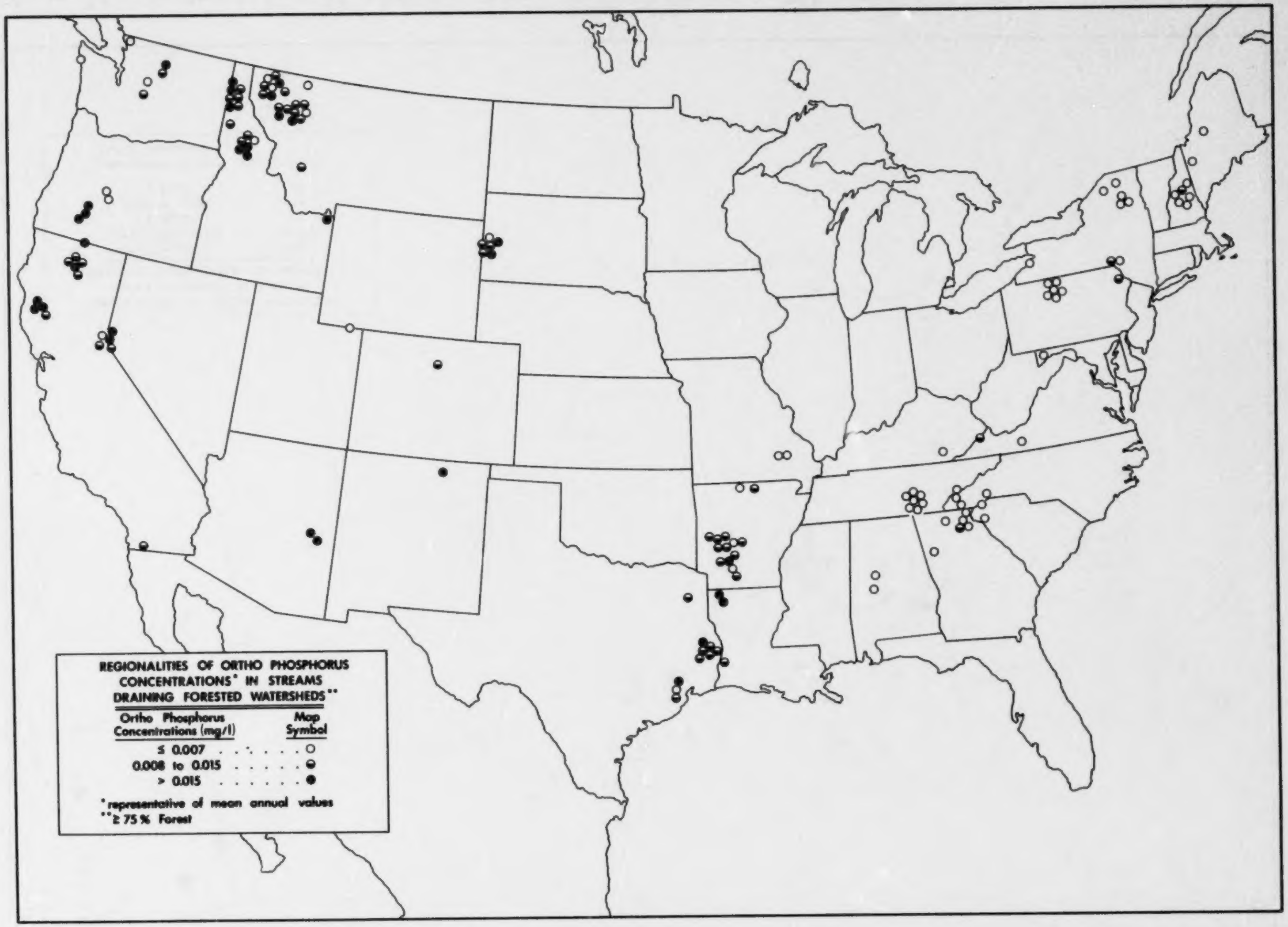
REGIONALITIES OF ORTHO PHOSPHORUS CONCENTRATIONS* IN STREAMS DRAINING FORESTED WATERSHEDS**
Ortho Phosphorus Concentrations (mg/l)
Map Symbol
≤ 0.007 ○
0.008 to 0.015 ◐
> 0.015 ●
*representative of mean annual values
**≥ 75% Forest

Figure 13. Regionalities of orthophosphorus concentrations in NES sampled streams draining forested watersheds.

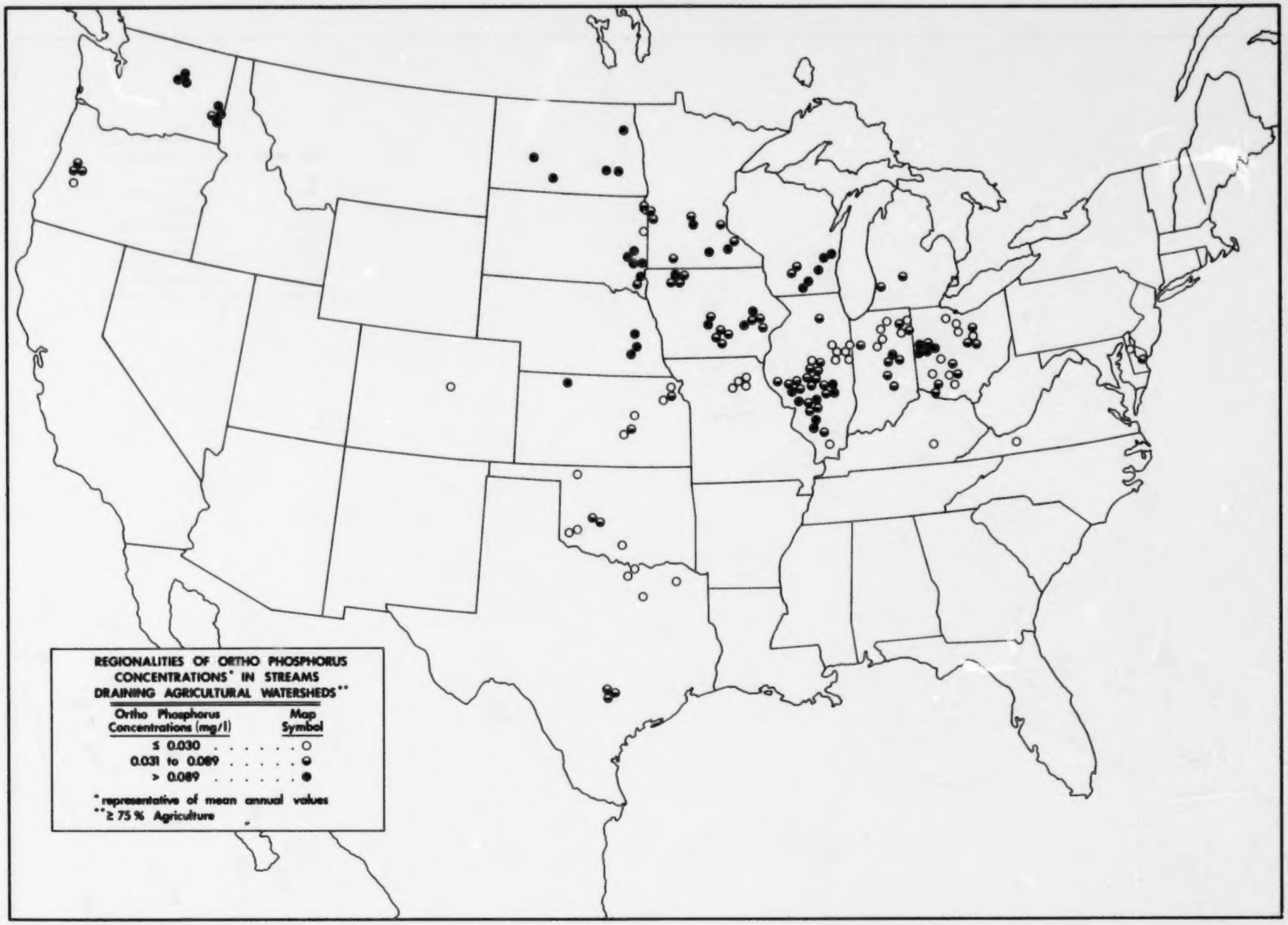
REGIONALITIES OF ORTHO PHOSPHORUS CONCENTRATIONS* IN STREAMS DRAINING AGRICULTURAL WATERSHEDS**
Ortho Phosphorus Concentrations (mg/l)
Map Symbol
≤ 0.030 ○
0.031 to 0.089 ◐
> 0.089 ●
*representative of mean annual values
**≥ 75 % Agriculture

Figure 14. Regionalities of orthophosphorus concentrations in NES sampled streams draining agricultural watersheds.

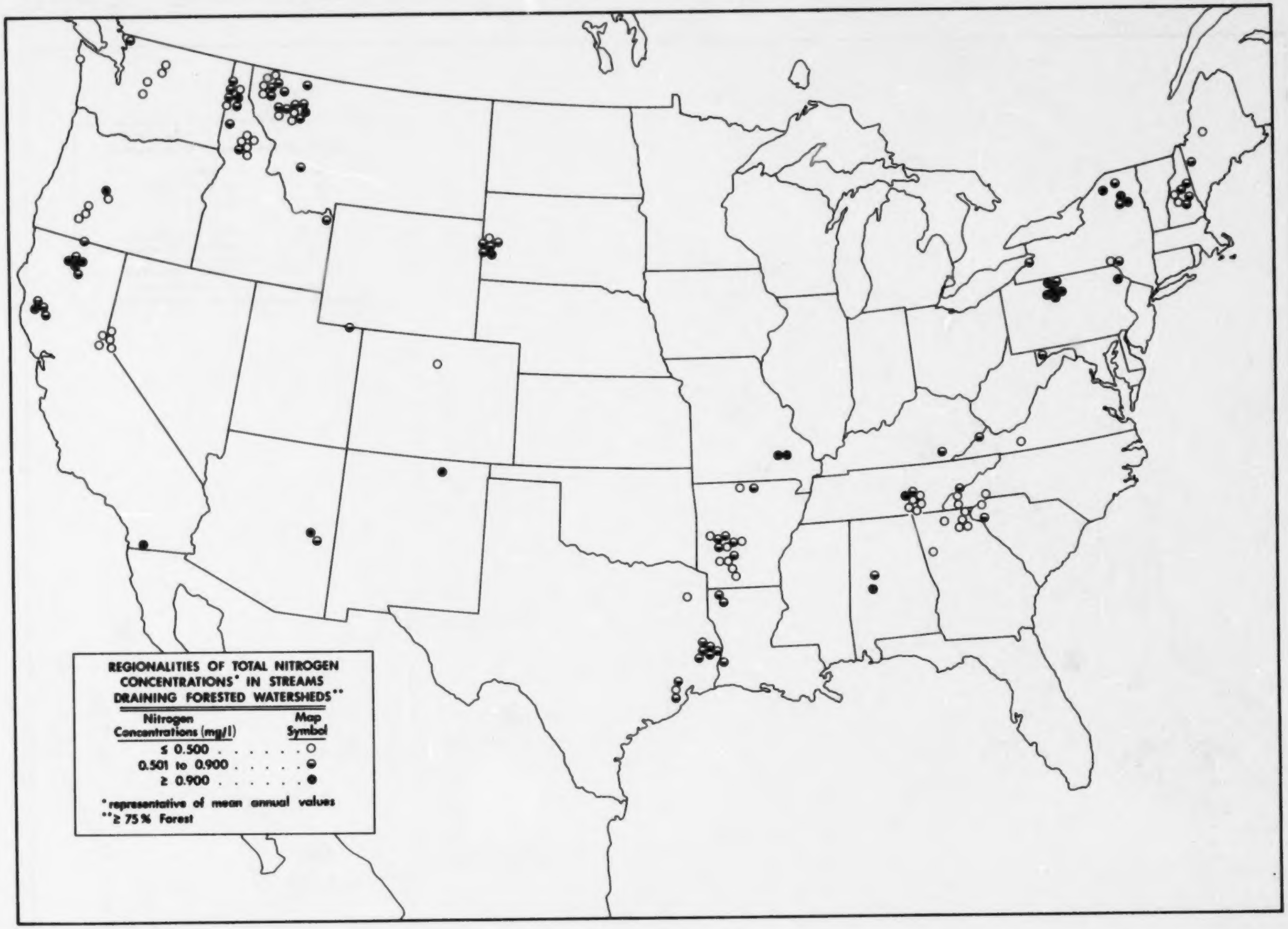
REGIONALITIES OF TOTAL NITROGEN CONCENTRATIONS* IN STREAMS DRAINING FORESTED WATERSHEDS**
Nitrogen Concentrations (mg/l)
Map Symbol
≤ 0.500 . . . . . . ○
0.501 to 0.900 . . . . . ◒
≥ 0.900 . . . . . . ●
*representative of mean annual values
**≥ 75% Forest

Figure 15. Regionalities of total nitrogen concentrations in NES sampled streams draining forested watersheds.

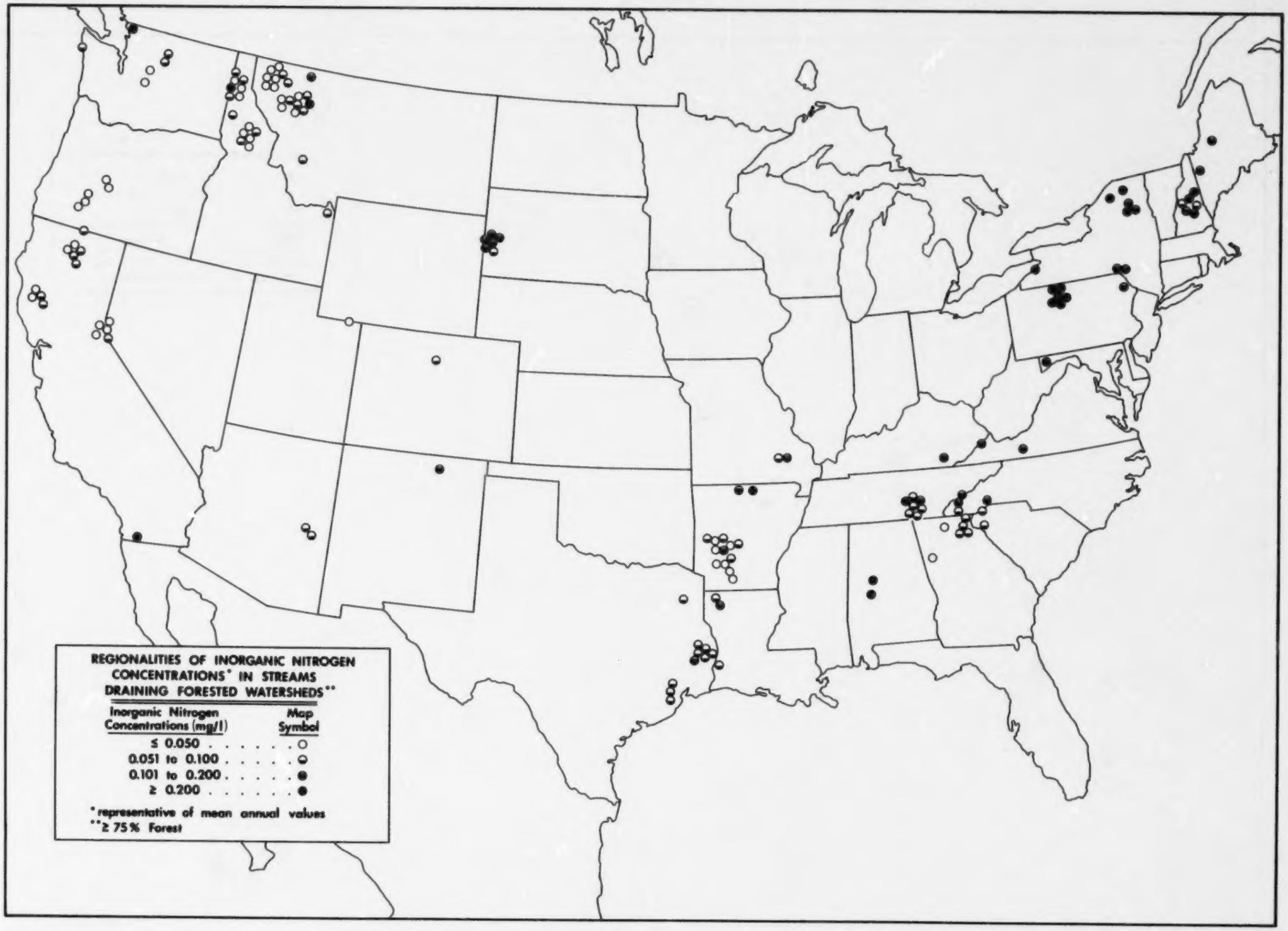
REGIONALITIES OF INORGANIC NITROGEN CONCENTRATIONS* IN STREAMS DRAINING FORESTED WATERSHEDS**
Inorganic Nitrogen Concentrations (mg/l)
Map Symbol
≤ 0.050 . . . . . . ○
0.051 to 0.100 . . . . . ◒
0.101 to 0.200 . . . . . ◕
≥ 0.200 . . . . . . ●
*representative of mean annual values
**≥ 75% Forest

Figure 16. Regionalities of inorganic nitrogen concentrations in NES sampled streams draining forested watersheds.

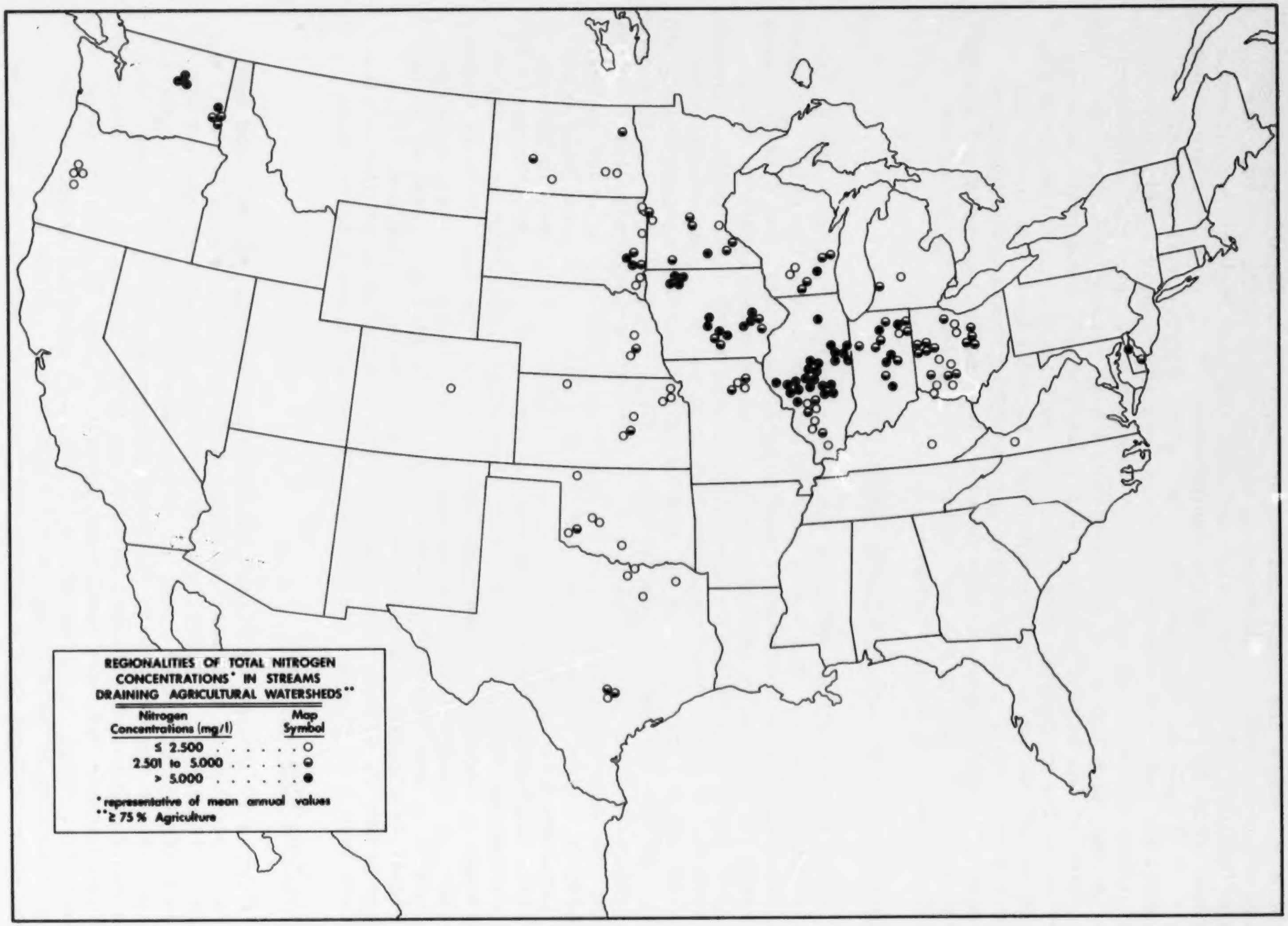
REGIONALITIES OF TOTAL NITROGEN CONCENTRATIONS* IN STREAMS DRAINING AGRICULTURAL WATERSHEDS**
Nitrogen Concentrations (mg/l)
Map Symbol
≤ 2.500 . . . . . . ○
2.501 to 5.000 . . . . . . ◐
> 5.000 . . . . . . ●
*representative of mean annual values
**≥ 75% Agriculture

Figure 17. Regionalities of total nitrogen concentrations in NES sampled streams draining agricultural watersheds.

fertilizer expenditures and higher domestic animal unit densities compared to the areas where the concentrations are lower (U.S. Department of Commerce, Bureau of Census 1972b). However, as was stressed in the previous section on applications, this is not meant to imply that the high nitrogen concentrations in surface waters in the central part of the corn belt are a direct result of fertilizer applications or any other agricultural practice. Certainly the nutrient-rich soils of the area that played a major role in determining the intensive agricultural land usage in the first place were also an important factor in determining the high stream concentrations. The proportion of the stream nutrient levels attributable to natural sources, relative to the proportion attributable to anthropogenic sources, probably cannot be determined at the present time. Nevertheless, one should not disregard the possible relationship between NPS anthropogenic inputs of nitrogen and high stream nitrogen levels. The regional patterns of inorganic stream concentrations in NES agricultural study areas (Figure 18) were similar to those of total nitrogen.

REGRESSION ANALYSES AND PREDICTIVE CAPABILITY

Early in this study, multiple regression analysis was selected as the most likely method for developing predictive models from the data. In order to accommodate the development of such predictive models, the data that were collected for each study watershed were for those macro-watershed characteristics thought to have a relationship to stream nutrient levels. However, the analyses of these data suggested that only one of the macro-watershed characteristics, land use, was related to stream nutrient concentrations and exports on both the national and regional levels. Regarding the entire data set, generally after the variations in stream nutrient concentrations related to land use were explained, the other macro-watershed characteristics were unimportant. When the data were analyzed by regions, and especially when they were shown cartographically, it became apparent that certain characteristics other than land use might be related to stream nutrient levels in some regions but not others. The fact that makes identification of these relationships unwieldy to seemingly impossible is that most of these characteristics are interrelated with one another, and these interrelationships vary spatially and temporally in such a way as to mask or otherwise affect individual relationships with stream nutrient levels. Therefore, this section primarily will be concerned with the relationships of land use to nutrient levels in streams and to regionalities of these relationships.

Contributing Land Use Types

Figures 19 through 22 illustrate the relationships between land uses generally considered nutrient contributing (% agriculture plus % urban) and nutrients in streams. Several ways of examining the effects of land use on nutrient concentrations or loads in streams were investigated. In general, nutrient levels increased with increased percentages in agricultural land usage and decreased percentages in forested land. Little to no correlation was found between nutrient levels and percent of land in either cleared-unproductive, range, urban or wetland. This was expected because of the probable masking effects of agriculture and forest. Since increased or decreased percentages of all general land use types appeared to have some

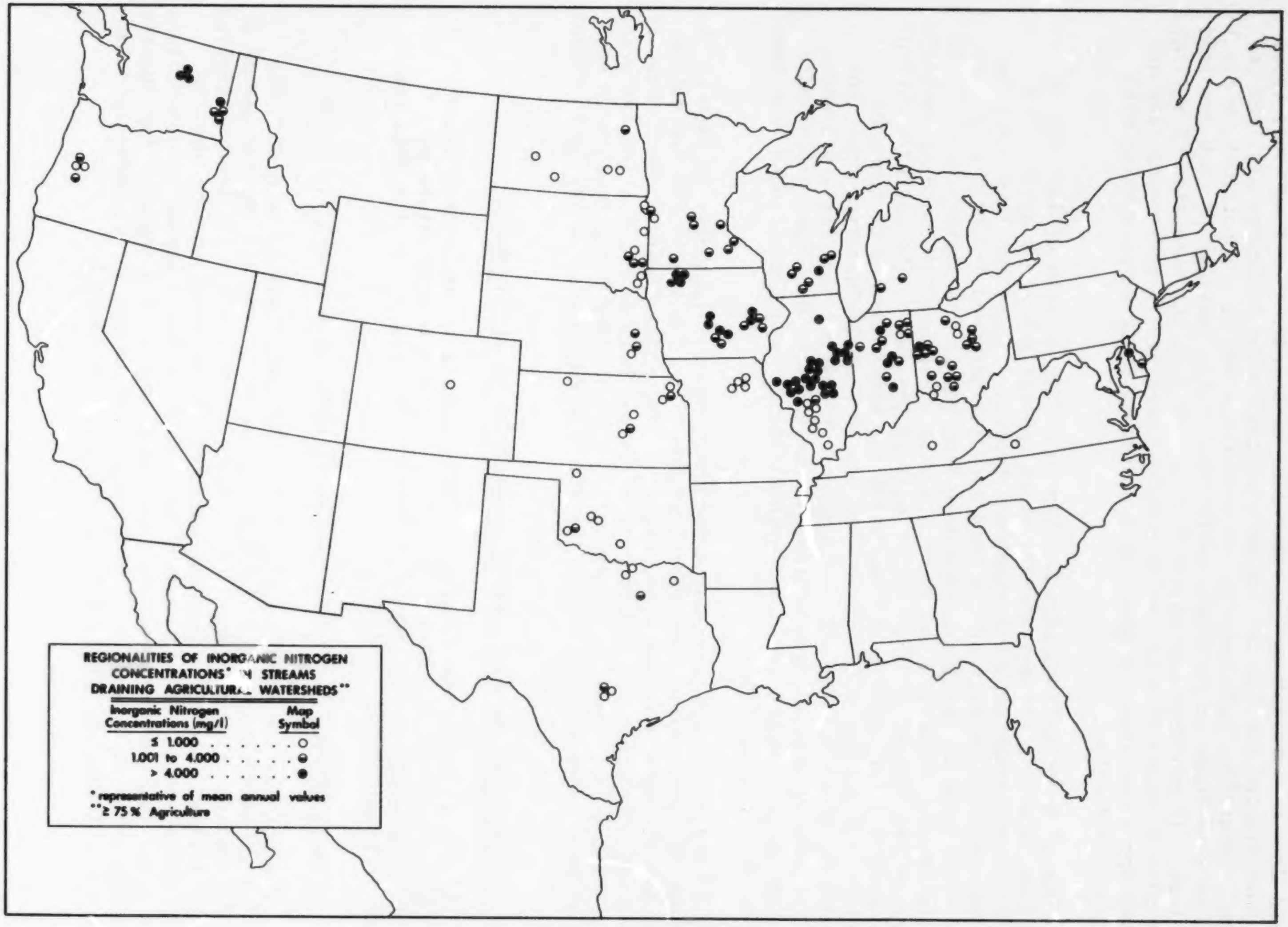
REGIONALITIES OF INORGANIC NITROGEN CONCENTRATIONS* IN STREAMS DRAINING AGRICULTURAL WATERSHEDS**
Inorganic Nitrogen Concentrations (mg/l)
Map Symbol
≤ 1.000 ○
1.001 to 4.000 ◐
> 4.000 ●
* representative of mean annual values
** ≥ 75 % Agriculture

Figure 18. Regionalities of inorganic nitrogen concentrations in NES sampled streams draining agricultural watersheds.

effect on nutrient levels, a land use ratio of contributing (agriculture + urban) to non-contributing (forest + cleared-unproductive + wetland) types was investigated for its utility as a single factor including all land use types. Generally, relationships between these ratios and nutrient levels in streams were found to correlate better than those considering only one land use type. It was then determined that use of just the numerator (% agriculture plus % urban) from the ratio provided more easily understood land use values and eliminated the graphing problems encountered by working with values to infinity.

Use of % agriculture plus % urban to relate effects of land use on nutrient levels in streams appears to be appropriate where agriculture and/or forest comprise the predominant type(s). These two land use categories comprise the bulk of the land use data gathered for this study but also constitute by far the predominant land use in the eastern half of the United States, as well as parts of the west where precipitation is adequate to cause significant surface runoff most of the year. The use of % agriculture plus % urban appears to compensate for minor amounts of the other general land use types. However, its use is probably unsatisfactory for predicting or estimating nutrient concentrations or loads for areas where either urban, cleared-unproductive, or wetland land use types predominate and particularly where urban use predominates. Insufficient data have been collected for these types.

It should be mentioned for the relationships illustrated by Figures 19 through 22, that rather than construct one line-of-best-fit for the entire data set for each nutrient form, regional lines-of-fit were chosen. However, where the intercepts are appreciably different between regions for one graph (e.g. Figure 20), the scatter generally appears wider than it would if each region were treated separately or if the intercepts are similar as in Figure 21.

Contributing Land Use--Nutrient Concentration Relationships

Figure 19 shows the relation between mean total phosphorus concentrations in streams and the contributing land use % agriculture plus % urban. The equation for the relationship involving the entire data set shown in Figure 19 is:

$$\text{Log}_{10}\ (\text{PCONC}) = -1.692 + .00816\ (\%\ \text{agric.} + \%\ \text{urban}) \quad (1)$$

The correlation coefficient (r) for this relationship is 0.65. The utility of this equation for estimations can be illustrated by the use of a multiplicative standard error. This factor, denoted by "f", when multiplied by and divided into the value estimated by the equation, determines the range which should contain roughly two-thirds of the observed concentrations at a given level of contributing land use (% agric. + % urban). For equation (1), the value of f is 2.05. The concentration ranges for different percentages of contribution land use types are shown in Table 5.

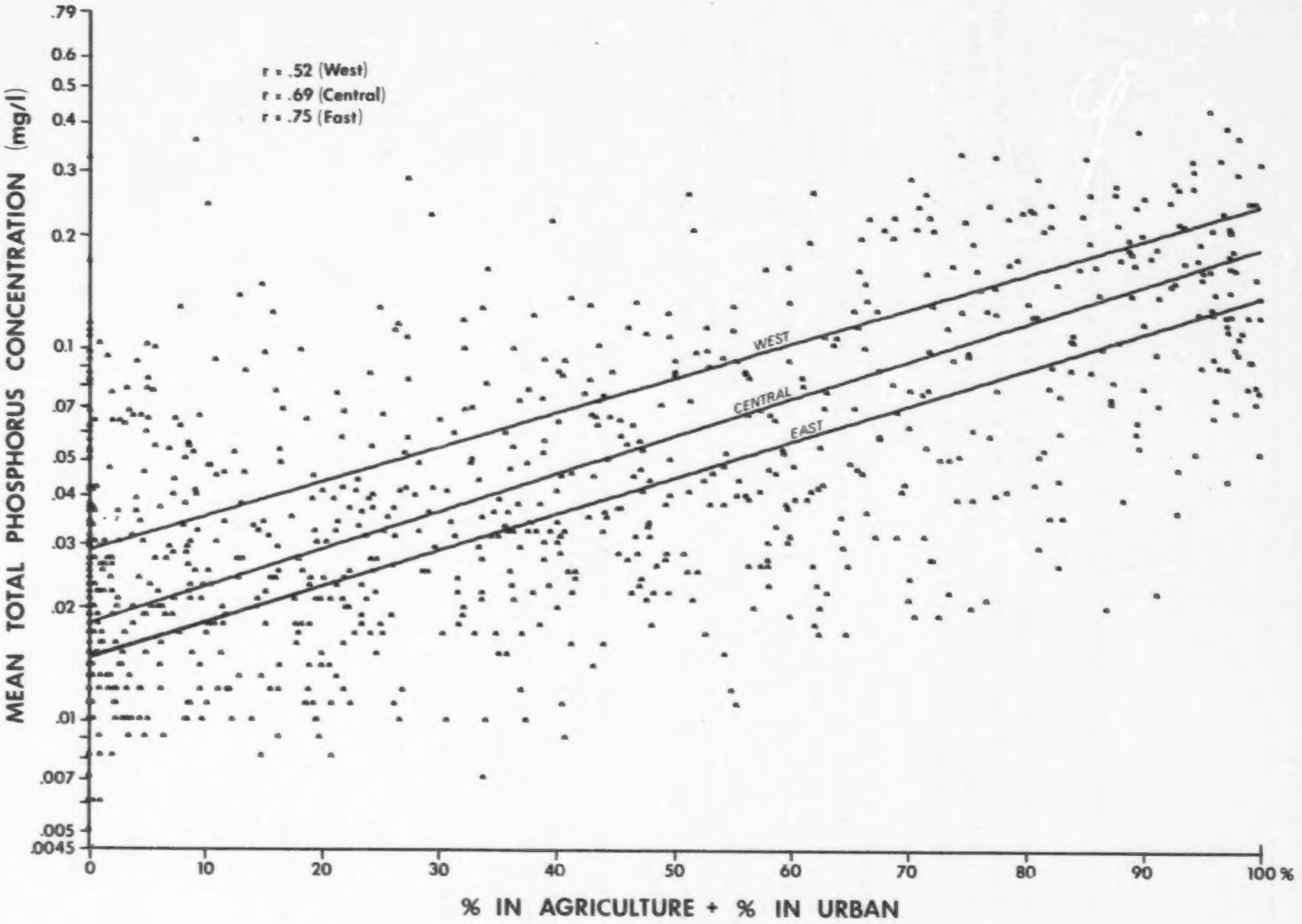

Figure 19. Scattergram of "contributing" land use types related to total phosphorus concentrations in streams.

TABLE 5. ESTIMATED MEAN TOTAL PHOSPHORUS CONCENTRATIONS (mg/l)

% Ag + % Urb	Avg. PCONC	67% Limits
0	0.020	0.010-0.042
25	0.033	0.016-0.067
50	0.052	0.025-0.106
75	0.083	0.041-0.170
100	0.133	0.065-0.272

For example, for streams draining areas with a combined agriculture plus urban land use percentage of 25%, mean total phosphorus concentrations average 0.033 mg/l. However, because of the variation around this estimation, there is only 67% probability that the true value will fall in the range 0.016 to 0.067 mg/l.

Another aid to the interpretation of this equation is given by a factor denoted by "Δ" which is the approximate percentage increase in the mean nutrient level corresponding to an increase of 10 percentage points in contributing land use (% agric. plus % urban). For example, for equation (1), W = 21% indicating that a watershed in which a total of 30% of the area is in agricultural and urban land use can be expected to have NPS stream phosphorus concentrations which are roughly 21% greater than those of a stream draining a watershed in which only 20% of the area is in contributing land use.

The equations for the regional regression lines shown in Figure 19 generally indicate higher correlations and better predictive capability than the equation for the entire data set, especially for the eastern region. The equations for regional models, along with the associated interpretive aids, are as follows:

for the eastern region,

$$\text{Log}_{10}\ (\text{PCONC}) = -1.836 + .00971\ (\%\ \text{agric.} + \%\ \text{urban}) \qquad (2)$$

$$r = 0.74,\ f = 1.85,\ \text{and}\ \Delta = 25\%$$

for the central region,

$$\text{Log}_{10}\ (\text{PCONC}) = -1.744 + 0.01010\ (\%\ \text{agric.} + \%\ \text{urban}) \qquad (3)$$

$$r = 0.69,\ f = 2.07,\ \text{and}\ \Delta = 26\%$$

and for the western region,

$$\text{Log}_{10}\ (\text{PCONC}) = -1.548 + 0.00929\ (\%\ \text{agric.} + \%\ \text{urban}) \qquad (4)$$

$$r = 0.52,\ f = 2.15,\ \text{and}\ \Delta = 24\%$$

Differences in estimated values using the model for the nationwide data set as compared to those for the regional models are shown in Table 6.

TABLE 6. ESTIMATED MEAN TOTAL PHOSPHORUS CONCENTRATIONS (mg/l) FOR NATIONWIDE AND REGIONAL MODELS

	Nationwide Model		Regional Models					
			East		Central		West	
% Ag + % Urb	Ave P Conc	67% Limits	Ave P Conc	67% Limits	Ave P Conc	67% Limits	Ave P Conc	67% Limits
0	0.020	(.010-.042)	0.015	(.008-.026)	0.018	(.008-.037)	0.028	(.013-.060)
25	0.033	(.016-.067)	0.026	(.014-.048)	0.032	(.015-.066)	0.048	(.022-.103)
50	0.052	(.025-.106)	0.045	(.024-.083)	0.058	(.028-.120)	0.083	(.038-.178)
75	0.083	(.041-.170)	0.078	(.042-.144)	0.103	(.049-.213)	0.141	(.065-.303)
100	0.133	(.065-.272)	0.136	(.073-.251)	0.185	(.089-.382)	0.240	(.111-.516)

Figure 20 illustrates the relationship between mean orthophosphorus concentrations in streams and "% agriculture plus % urban". The equation for the nationwide set of data points is:

$$\text{Log}_{10}\,(\text{OPCONC}) = -2.033 + 0.00710\,(\%\ \text{agric.} + \%\ \text{urban}) \qquad (5)$$

The correlation coefficient for the equation is 0.59; the multiplicative standard error (f), 2.07; and Δ, 18%.

The equations for the regional data sets showed better correlations and predictive capabilities, except for the western region. Equations, together with the associated interpretive aids, for the regional regression lines shown in Figure 20 are as follows:

for the eastern region,

$$\text{Log}_{10}\,(\text{OPCONC}) = -2.222 + 0.00934\,(\%\ \text{agric.} + \%\ \text{urban}) \qquad (6)$$

$$r = 0.73,\ f = 1.86 \text{ and } \Delta = 24\%$$

for the central region,

$$\text{Log}_{10}\,(\text{OPCONC}) = -2.082 + 0.00868\,(\%\ \text{agric.} + \%\ \text{urban}) \qquad (7)$$

$$r = 0.63,\ f = 2.09 \text{ and } \Delta = 22\%$$

and for the western region,

$$\text{Log}_{10}\,(\text{OPCONC}) = -1.851 + 0.00863\,(\%\ \text{agric.} + \%\ \text{urban}) \qquad (8)$$

$$r = 0.52,\ f = 2.05 \text{ and } \Delta = 22\%$$

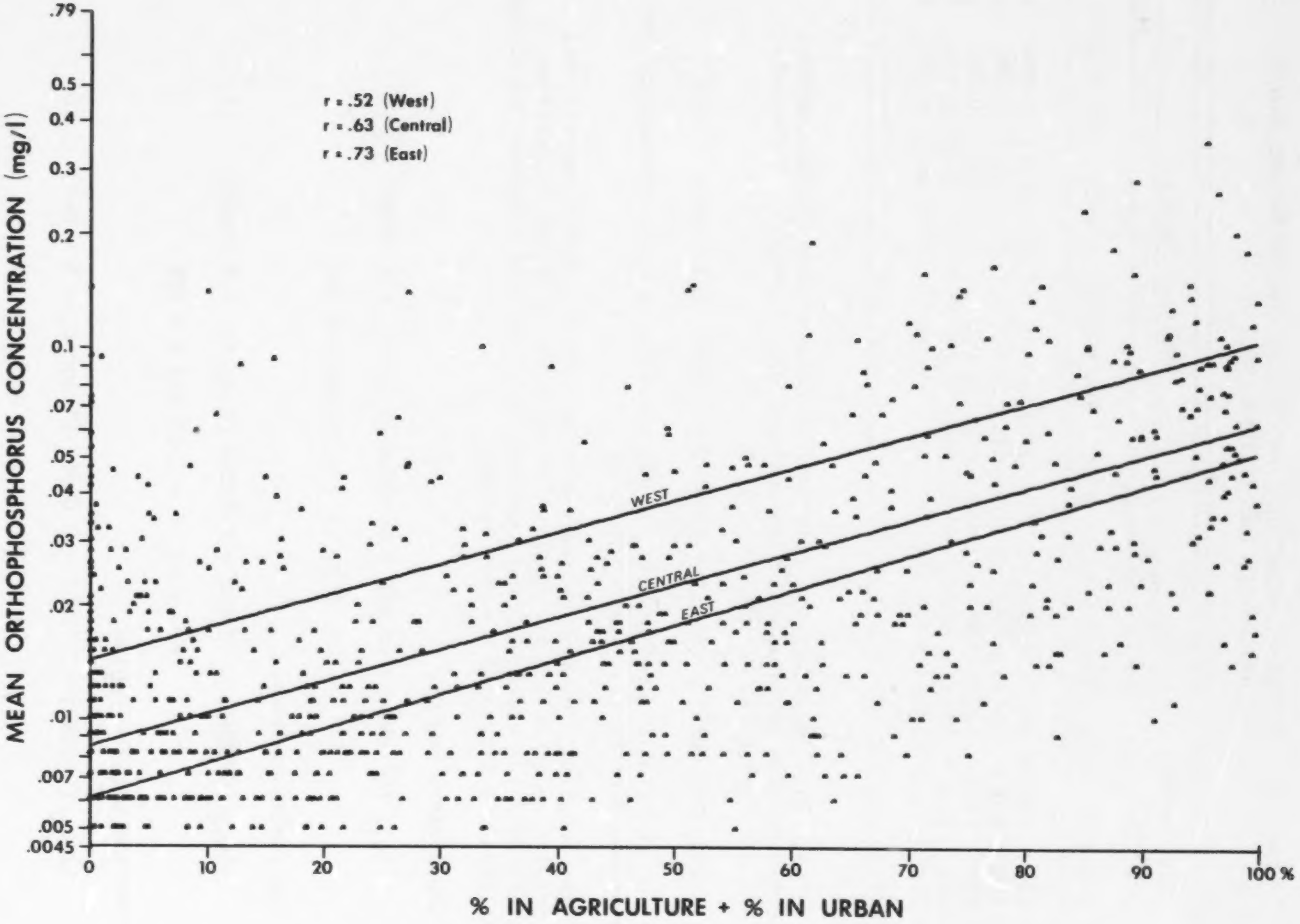

Figure 20. Scattergram of "contributing" land use types related to orthophosphorus concentrations in streams.

Figures 21 and 22 display somewhat higher correlations between stream nitrogen concentrations and "contributing" land use than were evidenced for phosphorus in Figures 19 and 20. Regarding the nationwide set of 904 watersheds, the equation and the interpretive factors for the regression shown in Figure 21 are:

$$\text{Log}_{10}\ (\text{NCONC}) = -0.247 + 0.00814\ (\%\ \text{agric.} + \%\ \text{urban}) \qquad (9)$$

$$r = 0.78,\ f = 1.62 \text{ and } \Delta = 21\%$$

It should be noted that the factor Δ appears to be a relatively poor interpretive aid for the regressions shown on Figures 21 and 22 because of the possible curvilinear relationships involved. As was mentioned earlier in the discussion of data shown in Figure 4 (page 29), increases in stream nitrogen concentrations proportionate to increases in agricultural land usage were greater for watersheds with $\geq$75% agricultural land usage than those with less agricultural land usage. However, analysis of Figure 4 and identification of the individual data points in the upper right hand corner of Figures 21 and 22, suggest the curvilinear relationship may only be characteristic of the eastern data set.

A rough idea of the utility of equation (9), using the multiplicative standard error of 1.62, is given in Table 7.

TABLE 7. ESTIMATED MEAN TOTAL NITROGEN CONCENTRATIONS (mg/l)

% agric. + % urban	Avg. NCONC	67% Limits
0	0.57	0.35-0.92
25	0.90	0.56-1.46
50	1.45	0.89-2.34
75	2.31	1.43-3.74
100	3.69	2.28-5.97

Similar to the findings for total phosphorus, two of the three equations for the regional regression lines shown on Figure 21 indicated better predictive capability than the equation for the entire nationwide data set. Only for the western region, which includes less than one-fourth of the study watersheds, was the correlation coefficient lower. Although the correlation coefficient is slightly less for the central regional model than that for the nationwide set, the multiplicative standard error is lower indicating less variation about the mean and greater predictive capacity. Equations for the regional regression lines shown on Figure 21, together with the related interpretive factors are:

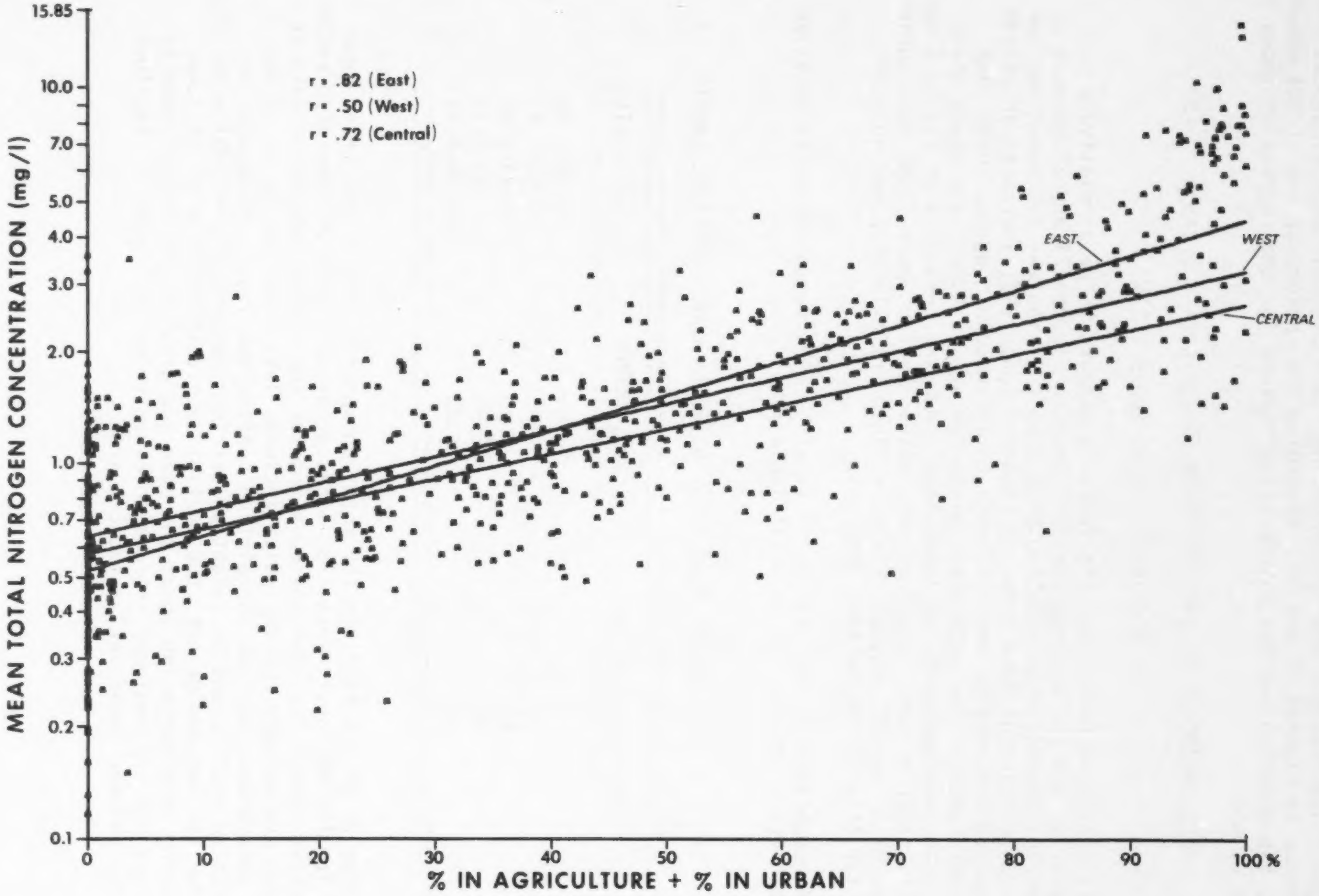

Figure 21. Scattergram of "contributing" land use types related to total nitrogen concentrations in streams.

for the eastern region,

$$\text{Log}_{10}\ (\text{NCONC}) = -0.292 + 0.00932\ (\%\ \text{agric.} + \%\ \text{urban}) \qquad (10)$$

$$r = 0.85,\ f = 1.52 \text{ and } \Delta = 24\%$$

for the central region,

$$\text{Log}_{10}\ (\text{NCONC}) = -0.246 + 0.00662\ (\%\ \text{agric.} + \%\ \text{urban}) \qquad (11)$$

$$r = 0.72,\ f = 1.54 \text{ and } \Delta = 16\%$$

and for the western region

$$\text{Log}_{10}\ (\text{NCONC}) = -\ 0.200 + 0.00704\ (\%\ \text{agric.} + \%\ \text{urban}) \qquad (12)$$

$$r = 0.50,\ f = 1.84 \text{ and } \Delta = 18\%$$

Differences in estimated concentrations using the regional and nationwide models are illustrated in Table 8.

TABLE 8. ESTIMATED MEAN TOTAL NITROGEN CONCENTRATIONS (mg/1) FOR NATIONWIDE AND REGIONAL MODELS

	Nationwide Model		Regional Models					
			East		Central		West	
% Ag + % Urb	Ave N Conc	67% Limits	Ave N Conc	67% Limits	Ave N Conc	67% Limits	Ave N Conc	67% Limits
0	0.57	(0.35-0.92)	0.51	(0.33-0.77)	0.57	(0.37-0.88)	0.63	(0.34-1.16)
25	0.90	(0.56-1.46)	0.87	(0.57-1.32)	0.83	(0.54-1.28)	0.95	(0.52-1.75)
50	1.45	(0.89-2.34)	1.49	(0.98-2.26)	1.22	(0.79-1.88)	1.42	(0.77-2.61)
75	2.31	(1.43-3.74)	2.55	(1.68-3.88)	1.78	(1.15-2.74)	2.13	(1.16-3.92)
100	3.69	(2.28-5.97)	4.37	(2.87-6.64)	2.61	(1.69-4.02)	3.19	(1.73-5.87)

Figure 22 portrays the relationship of inorganic nitrogen concentrations in streams to contributing land usage. Equations for the relationship involving the complete data set and the regional breakdowns are:

for the nationwide data set,

$$\text{Log}_{10}\ (\text{INCONC}) = -0.978 + 0.01404\ (\%\ \text{agric.} + \%\ \text{urban}) \qquad (13)$$

$$r = 0.79,\ f = 2.28 \text{ and } \Delta = 38\%$$

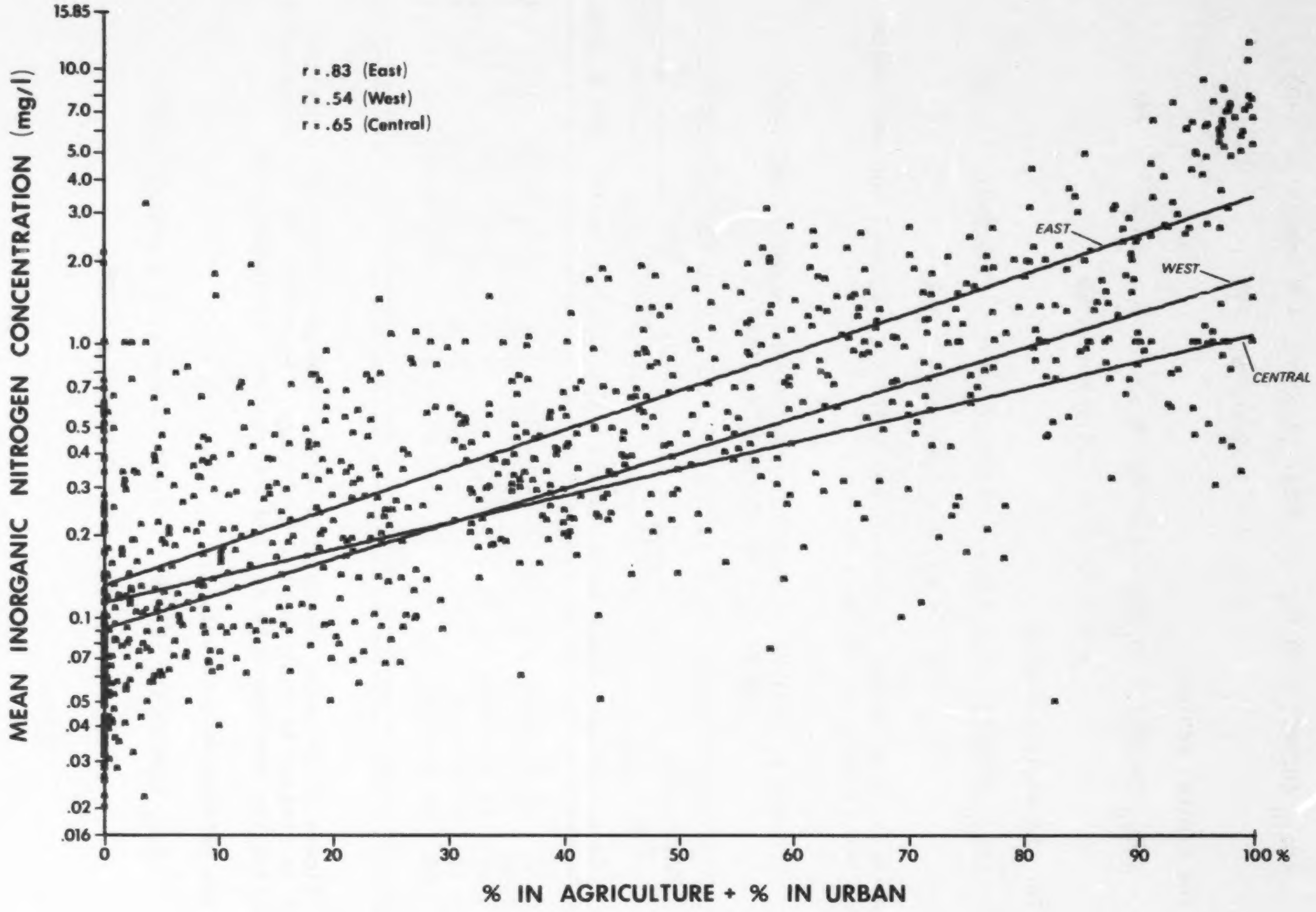

Figure 22. Scattergram of "contributing" land use types related to inorganic nitrogen concentrations in streams.

for the eastern region,

$$\text{Log}_{10}\ (\text{INCONC}) = -0.890 + 0.0146\ (\%\ \text{agric.} + \%\ \text{urban}) \qquad (14)$$

$$r = 0.83,\ f = 1.95 \text{ and } \Delta = 39\%$$

for the central region,

$$\text{Log}_{10}\ (\text{INCONC}) = -0.953 + 0.00975\ (\%\ \text{agric.} + \%\ \text{urban}) \qquad (15)$$

$$r = 0.65,\ f = 2.18 \text{ and } \Delta = 25\%$$

and for the western region,

$$\text{Log}_{10}\ (\text{INCONC}) = -1.048 + 0.01278\ (\%\ \text{agric.} + \%\ \text{urban}) \qquad (16)$$

$$r = 0.54,\ f = 2.70 \text{ and } \Delta = 34\%$$

Comparison of Figure 22 with Figure 21 reveals greater variation about the mean for the inorganic form of nitrogen than for total nitrogen. This is also evidenced by the substantially higher "f" values for the inorganic nitrogen equations as compared to those for total nitrogen.

Contributing and Forest Land Use--Nutrient Concentration Relationships

The preceeding equations reflect simple relationships between a combination of land use categories that had a positive correlation with NPS nutrient concentrations in streams. They afford a fairly good predictive capability for the eastern region of the United States and, for the total form of both nutrients, appear quite useful for the central region as well. For the west, however, their utility appears limited. This is probably due in large part to the greater percentages of range and cleared-unproductive land usage in the west. In the eastern and central regions, most of the area that was not in agricultural and urban land usage was largely forested. Since this is often not the case in the west, a slightly more complicated model was constructed which considered the negative correlation between percent of watershed in forest and stream nutrient concentrations in addition to the positive relationship between "contributing" land use percentage and stream nutrient concentrations. Equations for these models are given in Table 9 and the relationships are illustrated in Figures 23 and 24.

TABLE 9. REGIONAL STREAM NUTRIENT CONCENTRATION PREDICTIVE MODELS

Nutrient Form Region	Model, Correlation Coefficient and Multiplicative Standard Error
Total phosphorus	
East	$\log_{10}(\text{PCONC}) = -1.8364 + 0.00971\,(\%\ \text{agric} + \%\ \text{urb})$ $r = 0.74,\ f = 1.85$
Central	$\log_{10}(\text{PCONC}) = -1.5697 + 0.00811\,(\%\ \text{agric} + \%\ \text{urb}) - 0.002312\,(\%\ \text{for})$ $r = 0.70,\ f = 2.05$
West	$\log_{10}(\text{PCONC}) = -1.1504 + 0.00460\,(\%\text{agric} + \%\text{urb}) - 0.00632\,(\%\ \text{for})$ $r = 0.70,\ f = 1.91$
Orthophosphorus	
East	$\log_{10}(\text{OPCONC}) = -2.2219 + 0.00934\,(\%\ \text{agric} + \%\ \text{urb})$ $r = 0.73,\ f = 1.86$
Central	$\log_{10}(\text{OPCONC}) = -2.0815 + 0.00868\,(\%\ \text{agric} + \%\ \text{urb})$ $r = 0.63,\ f = 2.05$
West	$\log_{10}(\text{OPCONC}) = -1.5513 + 0.00510\,(\%\ \text{agric} + \%\ \text{urb}) - 0.00476\,(\%\ \text{for})$ $r = 0.64,\ f = 1.91$
Total nitrogen	
East	$\log_{10}(\text{NCONC}) = -0.08557 + 0.00716\,(\%\ \text{agric} + \%\ \text{urb}) - 0.00227\,(\%\ \text{for})$ $r = 0.85,\ f = 1.51$
Central	$\log_{10}(\text{NCONC}) = -0.01609 + 0.00399\,(\%\ \text{agric} + \%\ \text{urb}) - 0.00306\,(\%\ \text{for})$ $r = 0.77,\ f = 1.50$
West	$\log_{10}(\text{NCONC}) = -0.03665 + 0.00425\,(\%\ \text{agric} + \%\ \text{urb}) - 0.00376\,(\%\ \text{for})$ $r = 0.61,\ f = 1.75$

(Continued)

Table 9. (Continued)

Nutrient Form Region	Model, Correlation Coefficient and Multiplicative Standard Error
Inorganic nitrogen	
East	Log$_{10}$ (INCONC) =-0.3479 + 0.00858 (% agric + % urb) -0.00584 (% for) r = 0.84, f = 1.93
Central	Log$_{10}$ (INCONC) = -0.5219 + 0.00482 (% agric + % urb) -0.00572 (% for) r = 0.71,f = 2.06
West	Log$_{10}$ (INCONC) = -0.6339 + 0.00789 (% agric + % urb) -0.00657 (% for) r = 0.65, f = 2.45

Comparison of "r" and "f" values for these equations to those involving only "contributing" land use indicates that an improvement in predictive capability for the western region was gained through addition of percent of watershed in forest to the models. For the eastern and central regions, the addition of % in forest to the total P and ortho-P models generally resulted in little or no increase in the predictive capability. Where this occurred, new models incorporating the addition were not constructed for inclusion in Table 9 and Figures 23 and 24; instead, the regional models including only "contributing" land use are shown.

Figures 25 through 28 offer some qualitative refinement of the models shown in Table 8 by showing geographical areas where nutrient concentrations can be expected to be greater, much the same as, or less than those predicted by the models.

The data in Figure 25 illustrate some fairly obvious regional patterns. They indicate that total phosphorus concentrations in streams are generally higher than those predicted by the regional models in a very large region extending from Wisconsin, southern Minnesota, and Iowa west into Nebraska, South and North Dakota, and even northwestern Wyoming and southeastern Montana. Another area where total-P concentrations are, for the most part, higher than those predicted by the models comprises much of eastern Texas, Louisiana, and western Mississippi. This area appears to join a region of similarly high concentrations which extends from northwestern Tennessee through western Kentucky into southern and eastern Illinois and western Indiana. A very large region where phosphorus concentrations are nearly the same as, or lower than, those predicted by the model includes most of the Northeast from West Virginia, Maryland, and Pennsylvania through Maine, with

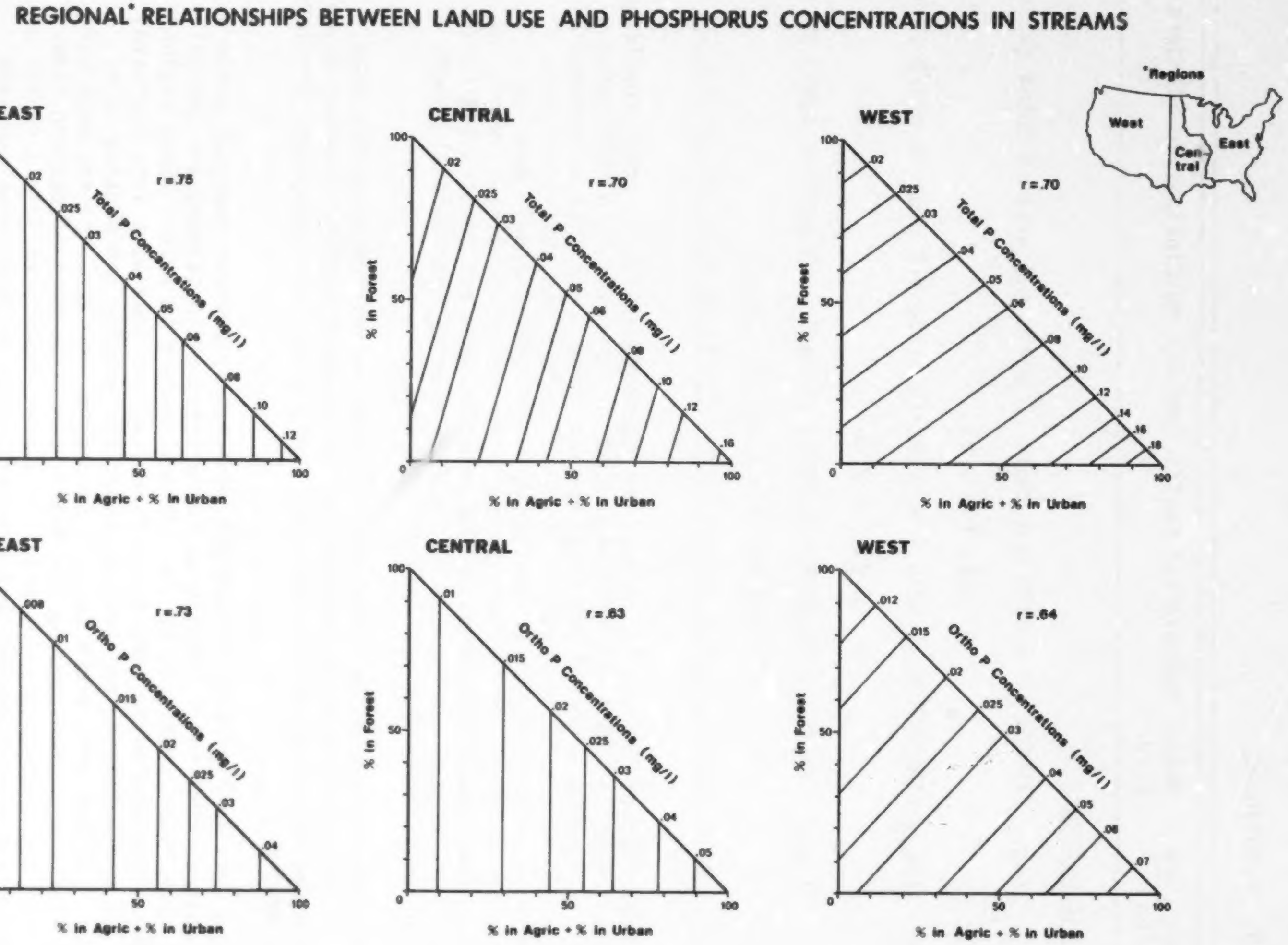

Figure 23. Differences in predictive characteristics between regional land use-phosphorus concentration models.

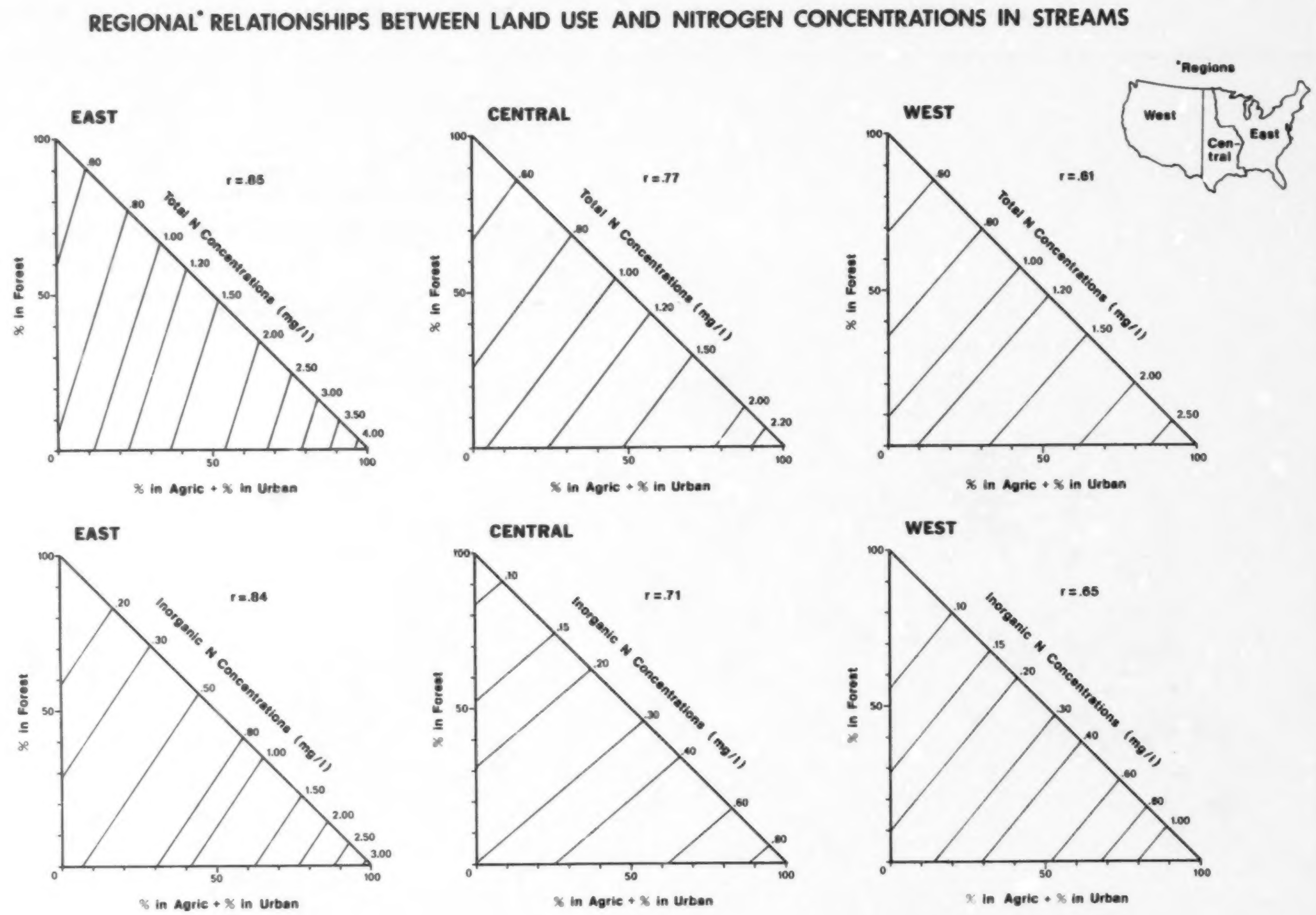

Figure 24. Differences in predictive characteristics between regional land use-nitrogen concentration models.

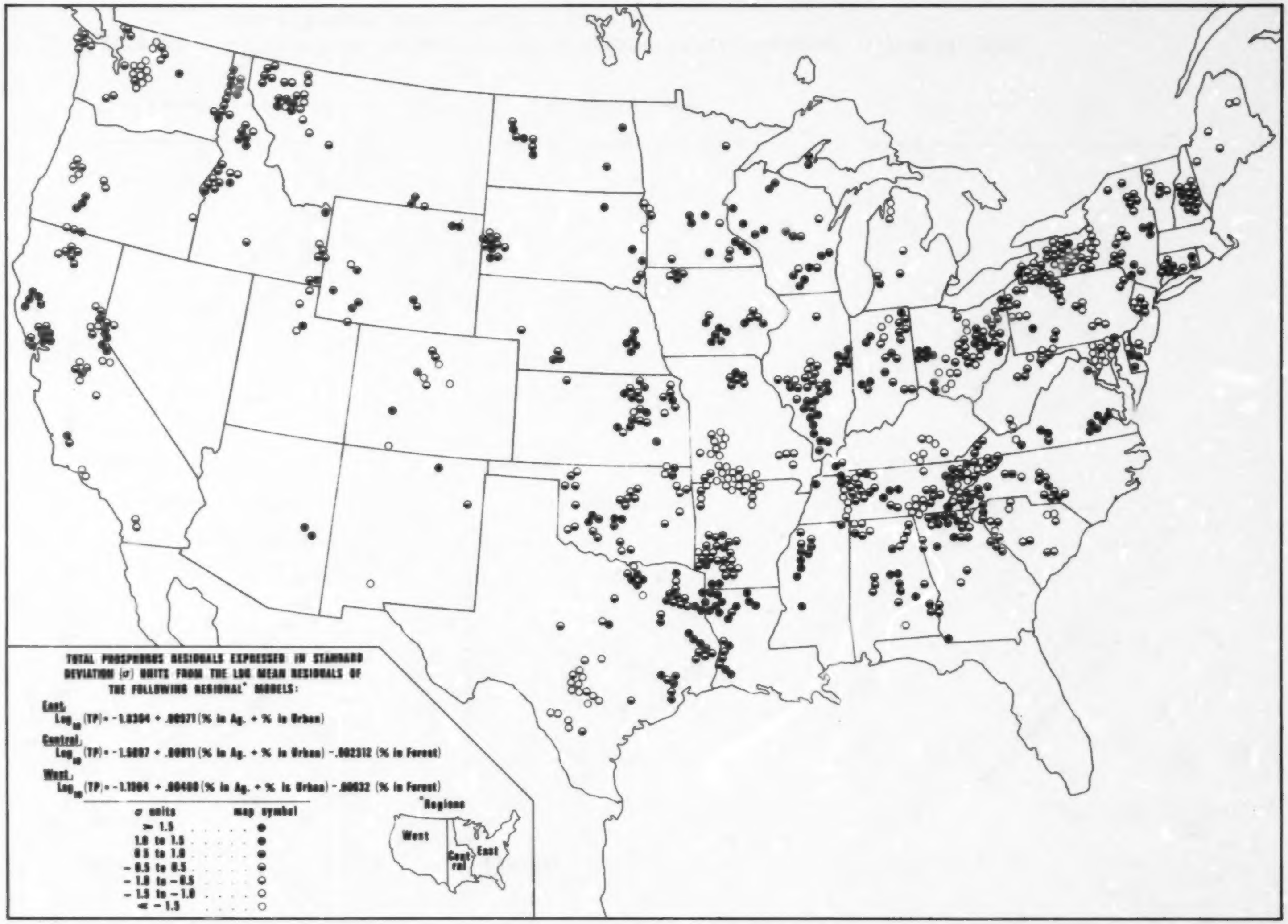
TOTAL PHOSPHORUS RESIDUALS EXPRESSED IN STANDARD DEVIATION (σ) UNITS FROM THE LOG MEAN RESIDUALS OF THE FOLLOWING REGIONAL* MODELS:
East,
$\text{Log}_{10}(TP) = -1.8304 + .00971$ (% in Ag. + % in Urban)
Central,
$\text{Log}_{10}(TP) = -1.5897 + .00811$ (% in Ag. + % in Urban) $- .002312$ (% in Forest)
West,
$\text{Log}_{10}(TP) = -1.1904 + .00400$ (% in Ag. + % in Urban) $- .00632$ (% in Forest)
σ units
map symbol
> 1.5 ●
1.0 to 1.5 ●
0.5 to 1.0 ●
− 0.5 to 0.5 ◒
− 1.0 to − 0.5 ◒
− 1.5 to − 1.0 ○
< − 1.5 ○
*Regions
West
Cent-ral
East

Figure 25. Areal distribution of residuals from regional predictive models for total phosphorus concentrations in streams.

the exception of the area centered on southeastern New York and Connecticut. Other smaller areas where phosphorus concentrations are mostly lower than those predicted are south-central Texas, central Ohio, and a small region extending from southern Missouri through northern Arkansas.

The regional patterns for orthophosphorus concentrations (Figure 26) are generally similar to those for total phosphorus. There are some notable exceptions, however. The large area in the Northeast, where total-P concentrations are generally the same as or lower than those predicted by the model, is more extensive on the orthophosphorus map. The same is true for the smaller area centered on northern Arkansas and southern Missouri which had concentrations consistently lower than those predicted by the total phosphorus model.

Regional patterns were also evident for the total nitrogen predictive models (Figure 27). The regional patterns illustrated by residuals of the nitrogen estimative model show little or no resemblance to those of the total phosphorus model. It is also noteworthy that neither map reveals patterns that appear to have any clear correlation with map units of the natural macro-aspects (such as physiographic regions, climatic characteristics, soil types, and geology) that one might expect to affect the regional patterns of the residuals. One exception to these general notations may be seen in the Pacific Northwest where the data indicate both nitrogen and phosphorus concentrations in streams draining the well-watered forested watersheds in western Oregon and western Washington to be generally well below those predicted by the models.

Figure 27 indicates three major areas where observed total nitrogen concentrations were above those predicted by the regional models. The first area is centered on the corn belt and includes most of Iowa, northern and central Illinois and western and central Indiana. The second area covers much of northern and central California. The third high area may exist in a region extending from the Black Hills of South Dakota through most of Wyoming and into the southern edge of Montana and southeastern tip of Idaho, but large gaps in data points make definition of this area difficult to support. This map also reveals a large area centered on eastern Pennsylvania, New Jersey, and southeastern New York (but including much of Delaware, east-central Maryland, central Pennsylvania, and northeastern New York and Connecticut) where total nitrogen concentrations in streams are near or above those predicted by the regional models. Figure 27 also suggests that throughout most of the Appalachian highlands and adjacent parts of the Piedmont, southern Illinois, southern Indiana, and southern Ohio, total nitrogen concentrations in streams can be expected to be near or below the levels the models predict. Another area of lower total-N concentrations is apparent in the western parts of Oregon and Washington, with the exception of the Puget Sound lowland.

Figure 28, depicting the regional patterns of residuals from the inorganic nitrogen regional models, illustrates both similarities and dissimilarities with the map of total-N residuals. Similar to the total-N map, Figure 28 reveals patterns of high inorganic-N concentrations in the corn belt and central part of the northeast. On the other hand, the high concentrations of total-N indicated for Wyoming and adjacent areas and

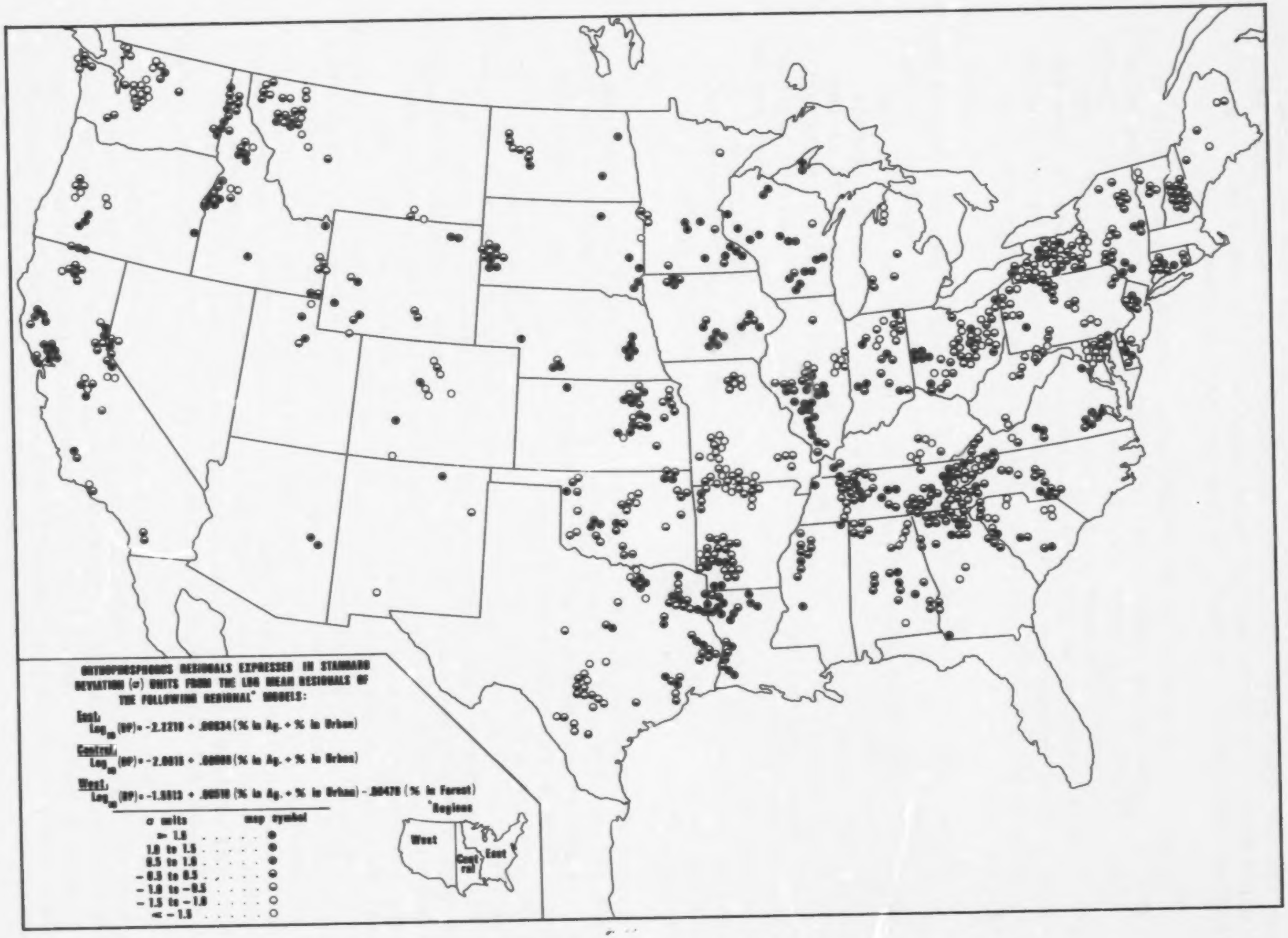
ORTHOPHOSPHORUS RESIDUALS EXPRESSED IN STANDARD DEVIATION (σ) UNITS FROM THE LOG MEAN RESIDUALS OF THE FOLLOWING REGIONAL* MODELS:
East:
Log10(OP) = -2.2218 + .00834(% in Ag. + % in Urban)
Central:
Log10(OP) = -2.0018 + .00080(% in Ag. + % in Urban)
West:
Log10(OP) = -1.5513 + .00510(% in Ag. + % in Urban) - .00470(% in Forest)
σ units
map symbol
≥ 1.5
1.0 to 1.5
0.5 to 1.0
- 0.5 to 0.5
- 1.0 to -0.5
- 1.5 to -1.0
≤ -1.5
*Regions
West
Central
East

Figure 26. Areal distribution of residuals from regional predictive models for orthophosphorus concentrations in streams.

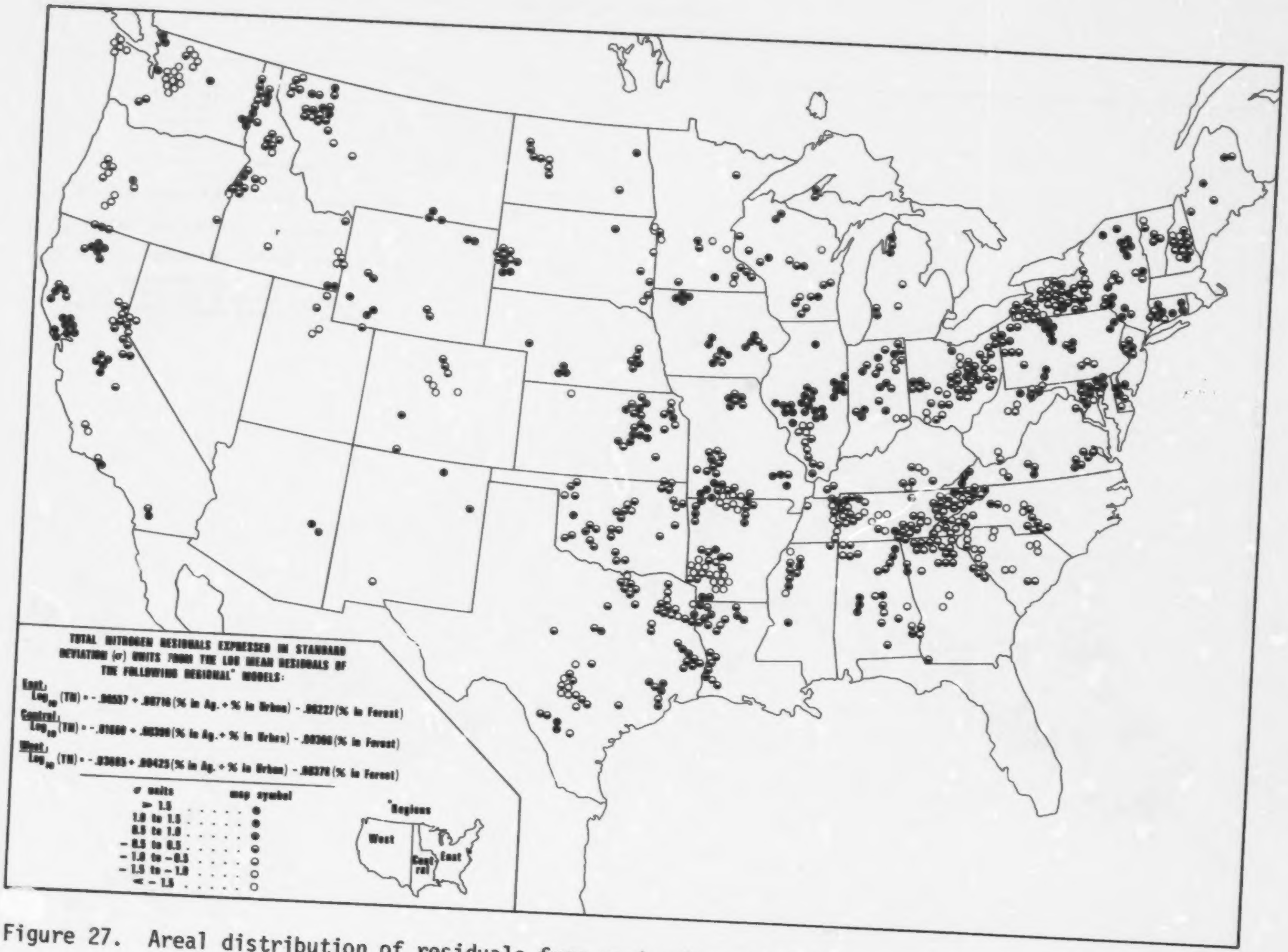
TOTAL NITROGEN RESIDUALS EXPRESSED IN STANDARD DEVIATION (σ) UNITS FROM THE LOG MEAN RESIDUALS OF THE FOLLOWING REGIONAL* MODELS:
East: $\log_{10}$ (TN) = -.00537 + .00710(% in Ag. + % in Urban) - .00227(% in Forest)
Central: $\log_{10}$ (TN) = -.01660 + .00390(% in Ag. + % in Urban) - .00360(% in Forest)
West: $\log_{10}$ (TN) = -.03005 + .00425(% in Ag. + % in Urban) - .00370(% in Forest)
σ units
map symbol
> 1.5
1.0 to 1.5
0.5 to 1.0
- 0.5 to 0.5
- 1.0 to - 0.5
- 1.5 to - 1.0
< - 1.5
*Regions
West
Central
East

Figure 27. Areal distribution of residuals from regional predictive models for total nitrogen concentrations in streams.

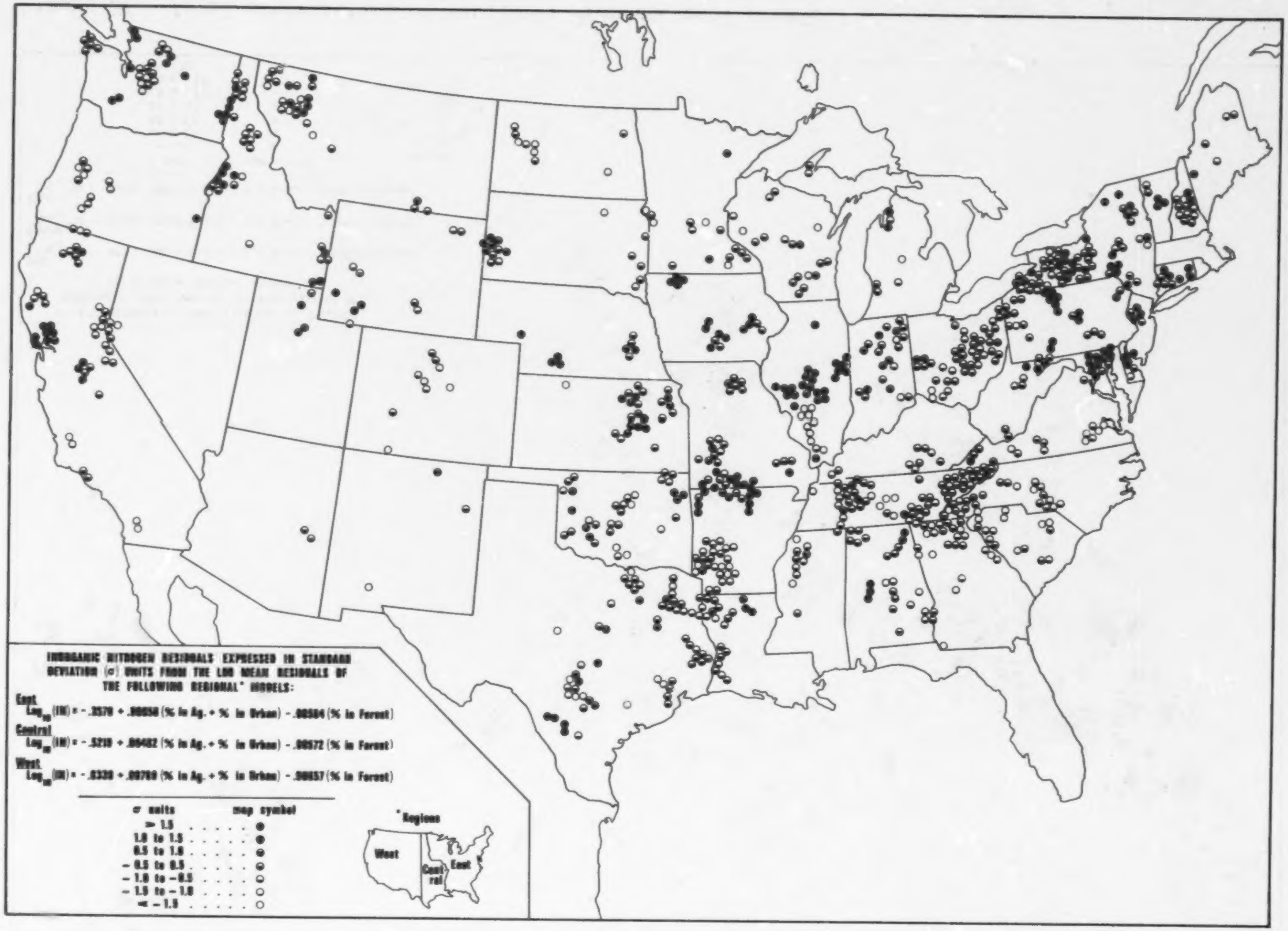
INORGANIC NITROGEN RESIDUALS EXPRESSED IN STANDARD DEVIATION (σ) UNITS FROM THE LOG MEAN RESIDUALS OF THE FOLLOWING REGIONAL* MODELS:
East
$\mathrm{Log}_{10}(\mathrm{IN}) = -.3570 + .00850(\%\ \mathrm{in\ Ag.} + \%\ \mathrm{in\ Urban}) - .00584(\%\ \mathrm{in\ Forest})$
Central
$\mathrm{Log}_{10}(\mathrm{IN}) = -.5210 + .00482(\%\ \mathrm{in\ Ag.} + \%\ \mathrm{in\ Urban}) - .00572(\%\ \mathrm{in\ Forest})$
West
$\mathrm{Log}_{10}(\mathrm{IN}) = -.0320 + .00789(\%\ \mathrm{in\ Ag.} + \%\ \mathrm{in\ Urban}) - .00657(\%\ \mathrm{in\ Forest})$
σ units . . . . . . map symbol
> 1.5
1.0 to 1.5
0.5 to 1.0
– 0.5 to 0.5
– 1.0 to – 0.5
– 1.5 to – 1.0
< – 1.5
*Regions
West
Central
East

Figure 28. Areal distributions of residuals from regional predictive models in inorganic nitrogen concentrations in streams.

northern and central California do not occur with inorganic nitrogen. Also, the pattern of low total-N concentrations in Oregon and Washington, which was quite clear in Figure 27, was not as pronounced for inorganic nitrogen.

Although the models presented illustrate a significant increase in the ability to estimate nutrient concentrations in streams using land use parameters, rather than simply using mean values of data points regardless of land use parameters, the models only indicate correlations found between existing land use patterns and nutrient concentrations in streams. It does not necessarily follow that the models can be used to predict changes in concentrations with associated changes in land use. However, gross predictions of this nature may be aided by analysis of the raw data (Appendix A) together with some of the individual relationships and regional patterns which have been illustrated.

Lastly, it is important to recognize why models for predicting nutrient export have not been included in this report. There are several reasons and they are somewhat interrelated. It is generally accepted that stream nutrient concentrations vary temporally as well as spatially because both natural phenomena and anthropogenic activities also vary with time and space. This makes it very difficult to focus on the land use--stream nutrient concentration picture from a regional or national perspective. However, with a massive nationwide data set, a uniform monthly (for one year) sampling scheme, uniform laboratory methods, and other safeguards to ensure a study of just "apples" and not "apples and oranges", the mean annual overall relationships that would not be visible with small data sets or site-specific studies should become apparent. The results of this study support this conclusion quite strongly. Even so, the temporal and spatial variations in the data still cloud the picture to a degree. In the construction of predictive models, if one were to include flow data, which is necessary for determination of export or loading rates, one would be incorporating another factor with probably as much or more spatial and temporal variation associated with it than that of nutrient concentrations. Hence, the "clouding" effect would be multiplied. But an even more important reason concerns availability of data. At the present time, for most of the United States there is a paucity of data on NPS nutrient concentrations in streams. There is not a paucity of stream flow data. There are excellent stream flow records for several thousand stream sites, representing both large and small watersheds, distributed throughout the nation. Therefore, where detailed stream nutrient data are unavailable but land use data are, nutrient export could be determined by using the regional nutrient concentrations models presented in this report, refining the concentration data where possible using the maps of residuals, obtaining flow data from the U. S. Geological Survey Surface Water Records for the particular area(s) of interest, and subsequently making the necessary calculations to determine nutrient loads.

MAPPED INTERPRETATIONS

After analyzing the data, uncovering the many apparent qualitative relationships and interrelationships between nutrient concentrations and NPS macro-watershed characteristics, and constructing the mathematical models, it seemed appropriate to compile composite graphical interpretations of these data and relationships in such a way as to provide planners, managers, and other users with a broad national overview of the relationships between stream nutrient levels and nonpoint sources. The three maps in the jacket inside the back cover of this report were compiled to accomplish this purpose.

It is extremely important to understand that these maps reflect both the natural and anthropogenic nonpoint areal characteristics related to nutrient concentrations in streams. It is difficult to impossible at this time, with this data set, to separate the natural sources from the anthropogenic sources. Although virtually all of the 928 study watersheds were without known point sources, each has to a certain degree been affected by man's activities, whether directly or indirectly (e.g., dairy cattle defecation in and along streams, atmospheric input from industrial or automotive emissions, etc.). However, one can study the patterns of NPS nutrient concentrations in streams and compare them with patterns of other natural and anthropogenic characteristics to get a better understanding of the spatial relationships and interrelationships involved. From analysis of these patterns it appears that there is more correlation between anthropogenic aspects (such as fertilizer applications and proximity to heavily populated or industrialized areas) and NPS nitrogen concentrations in streams than between those aspects and phosphorus concentrations. That is not to say the high nutrient concentrations in our nation's food baskets are due completely, or in large part, to fertilizer applications or other agricultural practices. Certainly much can be attributed to the nutrient rich soils that exist in these areas, which is the primary reason these areas are being so intensively farmed as compared to other areas where the soils are not as high in the essential nutrients. Nonetheless, the patterns exist, and they appear so significant one cannot ignore the possibility of such a relationship.

Basically, the development of each of the three stream nutrient concentration maps involved several preliminary processes. First, the actual mean annual nutrient concentrations were assigned to the representative positions of their true sampling site locations on a 1:3,168,000 scale base map. Then, an enlargement of Anderson's Major Land Uses map (U.S. Geological Survey, 1970) was prepared in color at the 1:3,168,000 scale (it should be noted that the land use category scheme used on Anderson's map is compatible, with some transposition, with that used for Figures 3 and 4). Next, a blank drafting film overlay was attached to the base map on which the actual concentrations for a given nutrient form had been annotated. These in turn were superimposed on, and registered to, the enlarged land use map. Then a 1:3,168,000 map illustrating all of the study watersheds by color coded dots, indicating their respective land use categories, was compared to the above map to enable the compiler to determine whether or not data points were representative of typical general land use in their respective regions.

By studying these mapped data and knowing the general relationships shown by the preceeding figures and tables in this paper, one could visualize the general land use patterns and the spatial relationships between observed stream nutrient concentrations and land use. Additional help in understanding the part other macro-watershed characteristics play was provided by comparison with various other maps including distribution maps of fertilizer expenditures, cattle, and other agricultural products or activities (U.S. Dept. of Commerce, Bureau of Census, 1972b); isometric maps of acid precipitation observations (Likens, 1975); and an ecoregions map, which in itself provides a regional breakdown of a synthesis of the macro-watershed characteristics relative to forest and rangeland resources (Bailey, 1976). Therefore, the actual drawing of the stream nutrient concentration map units was guided to a great extent by the alignment of Anderson's land use map units. However, as the observed values and their apparent relationships and interrelationships with existing land use and other phenomenon varied regionally, the map units were drawn to reflect these variations.

The nutrient concentration map units (each representing a range of concentrations) were determined mainly by analysis of the frequency distributions of the 928 values for each nutrient form. The objective was to obtain a fairly even distribution of values (observations) throughout each map's range of map units. Understandably, the map unit sizes were adjusted slightly to allow for even, understandable intervals.

The categories shown in the reliability map inset reflect several factors. The two most important are (1) the distribution of data points and (2) the types and homogeneity of land use in a given region together with the probable applicability of land use--stream nutrient concentrations relationships to that region. Also important were the significance of surface runoff in determining stream nutrient concentrations and the distinguishability of nonpoint from point source impact on streams. Examples of where the latter becomes a problem can be found in the flat tidal reaches of the Atlantic Coastal Plain and throughout much of Florida. Obviously, regions where NES stream sampling sites were concentrated and land use and watersheds were well defined, the reliability would be categorized as good. On the other hand, in arid areas where streams were scarce and stream data were difficult to obtain, the reliability would be categorized as poor. Areas categorized as fair generally were those where NES tributary sampling data were scarce or lacking but where land use and other macro-drainage area characteristics were such that reasonable estimates could be made based on the relationships and interrelationships observed in similar areas elsewhere.

INDIVIDUAL RELATIONSHIPS

Nutrient Runoff--Soils Relationships

The preliminary analysis of the relationships between soils and nutrient concentrations in streams, discussed in Working Paper No. 25, (U.S. Environmental Protection Agency, 1974b) indicated good correlations between pH characteristics in soils and nutrient concentrations in streams. Generally, concentrations were considerably higher in streams draining areas with soil orders characteristically high in bases than in streams draining areas with mostly acid-type soils. Efforts were therefore made to consider surface soil pH in the analysis of results in this follow up study. As alluded to earlier, time and money constraints necessitated use of a system for identifying the average surface soil pH for each watershed. That system left much to be desired, for the actual surface soil pH values probably varied considerably with land use within the area covered by a given soils map unit. For instance, for a given soils map unit in central South Carolina, the surface soil pH is probably a great deal higher in the active cropland areas than in the parts where pine forests predominate. However, even with these limitations, which if anything would have a "diluting" effect on the pH to stream nutrient concentration correlations, there appeared to be sufficiently good correlations in the eastern data set to warrant a more detailed examination of the relationship. The correlation coefficients for the relationships between surface soil pH and mean nutrient concentrations in streams which were reported in the previous publication were as follows:

pH and Total Phosphorus, $r = 0.58$

pH and Orthophosphorus, $r = 0.57$

pH and Total Nitrogen, $r = 0.61$

pH and Inorganic Nitrogen, $r = 0.55$

When the entire nationwide data set was analyzed for soil pH--nutrient concentration relationships, relatively poor correlations were found. They ranged from a low of 0.18 with inorganic nitrogen to a high of 0.38 with total phosphorus. Nevertheless, it seems improbable that soil pH is unrelated to nutrient concentrations in streams, particularly phosphorus. It is likely that the poor correlations are due to one or both of the following: 1) inadequacies in the system used to identify pH for each of the study areas and; 2) the complexities of soil pH--nutrient availability relationships which is complicated by spatial variations in availability of other minerals such as iron, aluminum, and calcium, which in turn influence the availability of nutrients.

Nutrient Runoff--Geology Relationships

Generally, the inclusion of geology as a macro-aspect to be considered in this study was motivated by the overall interest in geology--nutrient runoff relationships, the lack of nationwide-scale data on the subject, and the strength of the conclusions in one report (Dillon and and Kirchner, 1975) which suggested a significant effect of geology on nutrient loads in streams. Dillon and Kirchner's data indicate a strong effect of sedimentary geology on phosphorus loads in streams. Generally their mean values for sedimentary watersheds were between 2 1/4 and 2 1/2 times greater than those from igneous watersheds of plutonic origin. Additional data from the literature led Dillon and Kirchner to conclude that one would expect phosphorus loads in streams draining igneous watersheds of volcanic origin to be 15 times greater than in streams draining igneous watersheds of plutonic origin.

Figures 29 and 30 were compiled to illustrate the possible effects of watershed geologic origin on nutrient concentrations and loads in streams. The drainage areas were identified according to the geological classification outlined earlier in this paper, although only those classifications represented by a sufficiently large number of watersheds for a given land use category were included. The data were grouped by overall land use category to hold land use as a constant as possible. Data were not presented for drainage areas in the categories of $\geq$ 50% agriculture, mixed, urban, range, and cleared-unproductive because of either too much within-category land use variation or too few representative watersheds.

For the most part, data in Figures 29 and 30 indicate that given this classification scheme and the NES data, there is no apparent significant effect of geology on either phosphorus or nitrogen loads in streams. The same appears true for phosphorus and nitrogen concentrations. However, the examination of these data for each relationship is difficult because of the paucity of representative watersheds in some geologic classifications. It was for this reason that the "predominantly" classifications were included to aid the investigation. Nevertheless, the graphs indicate that there are no apparent relationships between geologic origin and stream nutrient levels.

It should be noted that the apparent relationship between geologic classification and nitrogen concentrations in streams (watersheds of sedimentary origin have stream nitrogen [particularly inorganic nitrogen] levels that are somewhat higher than those of igneous origin) may be related to the proximity of the stream to industrialized and/or populated areas and not geology. A larger percentage of the forested watersheds of igneous origin are in the west than in the east, and a greater percentage of the forested sedimentary watersheds are located in the east. As was discussed earlier, in the vicinities of highly populated and/or industrialized parts of the east, the level of inorganic nitrogen may be related to acid rainfall patterns as reported by Likens (1975).

It should be emphasized that the above analysis does not suggest that geology has no effect on nutrient concentrations or loads in streams. It does point out that no clearly important effects are apparent using this type of classification and the NES data, and that geologic origin, unlike land use, does not appear to be a macro-watershed parameter which will provide help in the development of models for predicting nonpoint-source stream nutrient levels.

An analysis of the NES data and geologic classifications using the scheme suggested in the earlier report (Omernik, 1976) and outlined in the Data Collection Methods sub-section proved only marginally fruitful. Comparisons of actual mean annual phosphorus concentrations in streams to the phosphorus compositions of rock types predominant in their associated watersheds are presented in Table 10.

TABLE 10. MEAN ANNUAL PHOSPHORUS CONCENTRATIONS (mg/l) IN STREAMS VS. PHOSPHORUS COMPOSITIONS OF PREDOMINANT ROCK TYPES

≥ 90% Forest

Region	Rock Type P Composition (%)	N*	Mean ann. strm. conc. Total-P	Mean ann. strm. conc. Ortho-P
East	≤ 0.074	18	0.011	0.006
	0.075 to 0.149	5	0.012	0.006
	≥ 0.150	0	--	--
Central	≤ 0.074	15	0.020	0.009
	0.075 to 0.149	0	--	--
	≥ 0.150	0	--	--
West	≤ 0.074	15	0.021	0.011
	0.075 to 0.149	12	0.025	0.015
	≥ 0.150	4	0.015	0.008
Nationwide	≤ 0.074	48	0.017	0.008
	0.075 to 0.149	17	0.021	0.012
	≥ 0.150	4	0.015	0.008

≥ 75% + ≥ 90% Forest

Region	Rock Type P Composition (%)	N*	Mean ann. strm. conc. Total-P	Mean ann. strm. conc. Ortho-P
East	≤ 0.074	36	0.013	0.006
	0.075 to 0.149	12	0.014	0.006
	≥ 0.150	1	0.015	0.006
Central	≤ 0.074	26	0.022	0.010
	0.075 to 0.149	3	0.028	0.011
	≥ 0.150	0	--	--
West	≤ 0.074	32	0.027	0.012
	0.075 to 0.149	25	0.027	0.014
	≥ 0.150	11	0.025	0.018
Nationwide	≤ 0.074	94	0.020	0.009
	0.075 to 0.149	40	0.023	0.012
	≥ 0.150	12	0.024	0.017

*Number of representative watersheds

Again land use was held relatively constant. Data for the ≥90% forest and ≥75% forest land use categories were combined in the second half of this table to provide larger numbers of watersheds representative of the various ranges in phosphorus potentials of rocks.

The values in Table 10 indicate that for the ≥90% forest land use category, phosphorus concentrations in streams are not higher in streams draining watersheds underlain with rocks of higher phosphorus composition. However, the interpretation of this data set is restricted by the lack of watersheds representing rock types classified in the medium to high phosphorus composition ranges. The second half of the table, showing comparisons relative to the combined land use categories having forest percentages ≥75%, contains a greater number of representative watersheds in almost all of the phosphorus potential ranges for the different regions and appears to show a slight relationship. Here, in most cases (regional or nationwide subgroups), mean phosphorus stream concentrations were greater in watersheds underlain by rock types classified in the high phosphorus content ranges than in those classified in lower ranges. The relationship is particularly evident with respect to orthophosphorus stream concentrations. That this relationship is qualified by the fact that the combining of the ≥75% forest data set with that of the ≥90% forest set added a greater amount of variability in land use, does not seem to be the case. As a matter of fact, there is a slight inverse relationship regarding both the western and nationwide ≥75% + ≥90% forest data sets. For example, the mean combined percentage of agricultural and urban land use for the 94 watersheds with rock type phosphorus compositions of ≥0.074% mg/l was 1.7%; for the 40 with percent compositions in the 0.075 to 0.149% range, it was 1.3%; and for the 12 with compositions ≥0.150%, it was 0.8%. However, the relationship was not good enough to provide assistance in the compilation of predictive models, mainly because, for many parts of the United States, there was a lack of available, reliable geology maps containing the level of detail necessary to adequately accomplish this type of classification. Also complicating and clouding the analyses were the variations in percentage compositions reported in the several different studies, reflecting the varying methods with which the data were obtained, the important regional differences, and the natural range in phosphorus content for any particular material. The chemical composition of sedimentary rocks is exceedingly variable, more so than igneous rocks, since sedimentation generally leads to further diversification. More than likely, depth of soil to bedrock was an additional complicating factor.

Nutrient Runoff--Drainage Density Relationships

In the planning stage of this project, it was suggested that drainage density (stream kilometers/square kilometer of watershed) might be related to stream nutrient levels. The decision to include this macro-watershed characteristic was finally made mid-way through the project after Kirchner (1975) published a paper which illustrated a very high correlation (r = 0.94) between phosphorus export and drainage density using a data set consisting of 18 forested, igneous drainage basins located in southern Ontario, Canada. Kirchner's stated purpose was to attempt to explain the variation in phosphorus export from forested basins underlain by plutonic igneous rock, reported by Dillon and Kirchner (1975) and thus facilitate more accurate predictions of phosphorus export from such watersheds.

The NES nonpoint source stream nutrient data did not reveal a good correlation between drainage density and either nutrient concentration or export. Holding land use constant (considering only the >90% forest data set, only the >90% agriculture data set, etc.), the mean annual values for both forms of both nutrients were regressed against drainage density. The correlation coefficients ranged from -0.27 to 0.19. Coefficients for export values were not appreciably different from those for concentration values nor were there any significant differences resulting from the use of logrithmic values.

ANOMALIES

At the time watersheds were being selected for possible inclusion in the study, a fairly detailed check of each watershed was conducted for possible point sources, significant indirect drainage upstream from the sampling site, and other aspects mentioned earlier in the selection criteria section. The principal tools for this particular investigation were USGS topographic maps, county highway maps, and miscellaneous lists of municipal and industrial waste discharge locations. Later when the aerial photography was being interpreted for land use identification, a second check was performed. Finally, a third check was accomplished after the land use had been identified and after the samples had been collected, analyzed, checked, and entered in computer files. Land use identification and stream sampling for a given part of the country were generally carried out during the same time period.

In the final checking process, the stream data for each watershed were carefully studied for irregularities, including point sources, but also for other sources of nutrients not characteristic of the overall land use for the areas represented. Because there were so many watersheds in the study, many of which were located in small clusters, they served as a check on one another. For instance, if there were four watersheds in one particular geographical region and all had similar land use patterns, soil types, slopes etc., but one of the four had far higher nutrient concentrations than the other three, a detailed check was made which usually included a call to the respective county extension agent or some other knowledgeable individual in the area in question. For problem or unusual watersheds, the sampling data were scrutinized for patterns that might indicate particular natural or anthropogenic causes. Generally, if a watershed had a source that was atypical of the overall land usage in the area it represented, that watershed was excluded from the data set. In a couple of cases, sampling sites with much higher concentrations than might be expected from the land usage in their areas had been located downstream from dumps or major interstate rest areas (which, for one reason or another, were not evident on the photography or maps). These were considered anomalies and were excluded from the data set. In a few cases, high nutrient concentrations were related to intensive seasonal grazing, poultry production, or some other activity which was typical of the land use for the particular area but because of spotty spatial patterns and simple happenstance, was not evidenced in nearby watersheds. These watersheds were left in the data set.

Although there were not many watersheds that were excluded from the study because of anomalies, some of those that were excluded are worthy of mention because they do, in fact, contain nutrient sources that are somewhere between point and nonpoint in nature and not at all representative of broad areal characteristics. These watersheds are listed below, by the creek on which the sampling sites were located:

1. Two unnamed creeks (STORET #'s 0802D1 and 08021E) southeast and east of Barr Lake, Colorado. Phosphorus concentrations in these streams were at least 10 times higher than one would expect in an agricultural area such as this, and the orthophosphorus concentrations were between 80% to 90% of those for total phosphorus. Nitrogen concentrations were about twice as high as one might expect for this area. A check with the local officials revealed only that the area was one of wheat farming and that there were no activities in the area that might explain the high values. However, the author visited the two sites and found numerous, recently-drilled, gas wells and much associated activity in both watersheds. It was not immediately obvious what activities associated with the gas drilling and piping operations gave rise to the high concentrations. Once the anomalous character of the watersheds was established, the data were dropped from the study; lack of time precluded further investigation.

2. Creek in Chalk Bluff Draw (STORET #3507D1) north-northeast of Lake McMillan in southeastern New Mexico. Very high nitrogen concentrations were noted in the creek--about five times higher than one might expect in this grassland area which, according to local officials, was grazed only lightly if at all. Inorganic nitrogen was particularly high and comprised about 86% of the total nitrogen, but phosphorus concentrations were very low. The county extension agent indicated that there were active oil-drilling operations in the watershed but couldn't explain the association with high nitrogen stream concentrations.

3. Arroyo Grande Creek (STORET #0614A2) and Lopez Canyon Creek (STORET #0614C1) upstream from Lopez Reservoir, east of San Luis Obispo, California. Throughout the year phosphorus concentrations in these creeks were consistently about 10 times higher than one might expect in watersheds of similar land use characteristics. Mean annual orthophosphorus concentrations were about 80 to 90% of those for total phosphorus. The nitrogen concentrations in the creeks appeared to be normal. The local farm advisor noted that there were low grade phosphate deposits in the area and that there had even been some effort to mine them. Further checking with local geologist supported the existence of phosphate deposits; but to their knowledge, the formation (a highly phosphatic calcareous siltstone) was not being mined commercially, although some of the overburden had been removed for building stone, probably exposing the phosphate deposits.

4. Wyatt Creek (STORET #2201E1), upstream from Anacoco Lake in western Louisiana. Phosphorus concentrations were about four to five times higher than would be expected in a predominantly forested watershed such as this, and the total nitrogen to total phosphorus ratio of about 4.7:1 indicated a possible point source. A recheck of the maps and aerial photos and a call to local officials revealed a major rest area on U.S. Hwy. 171 in the watershed.

5. Plainview Creek (STORET #41041F) about 11 miles southeast of Albany, Oregon. Both phosphorus and nitrogen concentrations in this stream were considerably higher than those of nearby, similar agricultural watersheds. The phosphorus concentrations were 10 to 15 times higher and the nitrogen concentrations were about two times higher. The probable reason for these high concentrations was discovered during a visit to the watershed. Two fertilizer distribution facilities were found; one was located about 150 meters from the stream and about 2.5 kilometers upstream from the sampling site, and the other was located about 3.5 kilometers upstream from the sampling site.

6. Harvey Creek (STORET #4827R1) near Sam Rayburn Reservoir in eastern Texas. The streams draining this watershed and two others in the immediate area had phosphorus concentrations that were about three to four times higher than would be expected in a forested area in this part of the country. Visits to these watersheds were impossible because of the expense involved, so telephone calls were made to individuals living in the vicinity of the watersheds. Conversations with these people revealed a point source in one of the watersheds and a great deal of logging (including clearcutting) and a limited amount of agricultural activity in the others. A dump, located directly upstream from the sampling site on Harvey Creek, comprised the point source and necessitated removal of the watershed it occupied from the data set. The other two watersheds exemplified nonpoint source activity and therefore remained in the study.

FOLLOW-UP STUDIES

Although the results of this study clarify some of the relationships between macro-drainage area characteristics and nonpoint-source phosphorus and nitrogen levels in streams, much room for improvement remains. It seems likely that a significant amount of the variability in nutrient levels which is not explained using the systems outlined in this study, might be accounted for through refinement of the systems. Based on findings of this study, two refinements in particular appear to offer the most promise.

Probably the most important of these refinements involves the proximity of the general land use category to perennial streams. This will be a complicated aspect because it involves the addition of another dimension. In general, the characteristics accounted for by systems used in this study are those of an overall nature, such as percent of total watershed area in a given land use, mean slope, average animal unit density, etc., without regard to the spatial relationship with perennial streams in the watershed. Intuitively, most would probably agree that all other factors being equal, a watershed having a 50% cover of forest located in the stream valleys and a 50% cover of agricultural land located in the interfluvial areas would have lower stream nutrient levels than a watershed having the reverse land use pattern (50% cover of forest in the interfluvial areas and 50% cover of agricultural land in the stream valleys). In order to keep it easy to use and more or less universal in applicability, the predictive system could consider the percent of each general land use type within three regions of each watershed: along the main stream in the watershed, in the interfluvial areas furthest from the perennial streams, and the area between the first two.

The second refinement would be the development of agricultural phosphorus and nitrogen factors for use in the predictive models. These factors would take into account fertilizer usage as well as animal-unit density. Moreover, there appears to be considerable room for improvement in the animal unit density factors themselves, but this too involves a tricky additional dimension. Rather than base the animal unit densities purely on average animal nutrient production (Table 2; page 17), the factors might include consideration of the nature of a given type of animal production relative to the likelihood of its effects on stream nutrient levels. A system involving factors such as these would, for example, likely give less weighting to commonly pastured beef animals than to generally more confined dairy animals.

Another consideration is periodicity. There is a strong possibility that with the nationwide data set of over 900 NPS stream sites from which samples were taken on the average of monthly for a year, one might be able to identify regionalities of high nutrient concentration periods. In turn, these regional high periods could be compared with data on natural phenomena, such as climatic characteristics, or data on man's activities, such as field tillage, to help identify associations that could lead to corrective methodologies in areas where high stream nutrient levels are of great concern.

SECTION VI

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SECTION VII

APPENDIX

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS 1 STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES 2 FOR	CL	RA	AG	URB	WET	OTHER	OVERALL LAND USE CATEGORY 3	GEOLOGY 4 ORIGIN	P-COM (%)	MEAN SLOPE (%)	PH 5	AVE ANN PRECIP. (CM)	FLOW 6 (CM/SQ KM)
ALABAMA															
GANTT RESERVOIR															
0103B1	21.26	74.5	.6	0	24.9	0	0	0	50 FOR.	1113	.070	8.8	4.5	147	.155
GUNTERSVILLE RESERVOIR															
0104A1	53.92	52.2	3.4	0	43.5	0	0	.9	50 FOR.	1210	.032	11.0	4.5	137	1.410
0104E1	78.55	34.9	2.5	0	61.8	.5	0	.3	50 AG.	1311	.060	5.9	4.5	137	1.580
0104G1	55.06	24.4	1.1	0	74.3	0	0	.2	50 AG.	1314	.060	3.6	4.5	132	1.060
0104J1	127.74	42.8	1.6	0	55.4	.1	0	.1	50 AG.	1314	.060	4.7	4.5	132	2.440
0104L1	22.17	60.0	1.3	0	24.0	0	0	14.7	50 FOR.	1010	.043	9.3	4.5	132	.460
HOLT LOCK AND DAM															
0105B1	5.44	93.8	1.4	0	2.4	0	0	2.4	75 FOR.	1111	.050	16.2	5.0	135	.090
0105C1	4.47	89.9	1.7	0	3.3	2.9	0	2.2	50 FOR.	1111	.050	23.3	5.0	135	.050
0105D1	29.86	85.0	1.0	0	0	0	0	14.0	75 FOR.	1111	.050	21.9	5.0	135	.470
LAY LAKE															
0106C1	22.07	74.7	1.5	0	23.8	0	0	0	50 FOR.	1213	.020	6.6	4.5	140	.390
0106D1	45.38	69.0	2.6	0	27.7	.1	0	.6	50 FOR.	1212	.020	10.3	4.5	140	.830
MARTIN LAKE															
0107C1	40.71	73.3	6.0	0	19.5	1.1	0	.1	50 FOR.	3136	.073	9.2	4.5	135	.710
0107H1	43.36	79.1	1.3	0	19.1	0	0	.5	50 FOR.	3131	.043	7.3	4.5	135	.320
MITCHELL LAKE															
0108B1	26.94	63.2	.7	0	35.7	0	.3	.1	50 FOR.	3137	.101	9.0	4.5	142	.540
PICKWICK LAKE															
0109C1	174.80	64.8	9.0	0	24.6	.9	0	.7	50 FOR.	1010	.042	13.0	4.5	127	2.290
0109D1	134.32	74.8	4.1	0	20.7	.1	0	.3	50 FOR.	1010	.042	16.7	4.5	127	1.810
0109K1	42.48	76.6	4.2	0	19.1	0	0	.1	50 FOR.	1112	.062	15.8	4.5	127	1.040
0109M1	173.63	80.2	3.5	0	16.2	0	0	.1	50 FOR.	1112	.062	18.2	4.5	127	2.720
0109Q1	11.60	80.4	11.3	0	8.3	0	0	0	50 FOR.	1010	.042	19.5	4.5	132	.190
W. F. GEORGE RESERVOIR															
0111B1	31.44	84.6	2.3	0	11.2	0	.9	1.0	50 FOR.	1310	.033	8.2	4.5	135	.450
0111C1	117.85	81.6	5.3	0	12.6	0	.3	.2	50 FOR.	1316	.060	9.0	4.5	135	1.310
0111J1	25.74	72.9	5.6	0	19.8	.2	1.5	0	50 FOR.	1300	.040	10.1	4.5	132	.320
0111M1	32.50	58.0	3.9	0	37.5	0	.4	.2	50 FOR.	1300	.040	7.9	4.5	135	.410
WEISS LAKE															
0112C1	26.42	89.2	1.4	0	9.4	0	0	0	50 FOR.	1010	.040	20.4	4.5	132	.460
0112E1	23.65	50.3	45.2	0	4.5	0	0	0	50 FOR.	1010	.040	7.5	4.5	132	.390
WILSON LAKE															
0114F1	7.30	25.7	8.1	0	66.1	0	0	.1	50 AG.	1200	.020	3.6	4.5	127	.090
LAKE PURDY															
0115B1	8.44	89.8	1.3	0	8.8	0	0	.1	50 FOR.	1314	.060	19.8	5.0	140	.180
0115C1	3.99	72.5	0	0	26.9	.3	0	.3	50 FOR.	1314	.060	12.1	5.0	140	.090
ARIZONA															
FOOLS HOLLOW LAKE															
0402C1	25.11	95.8	.8	0	3.0	.3	0	.1	75 FOR.	1226	.081	5.2	7.2	38	.003

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM) TOT P	TOT N	MEAN CONCENTRATIONS (MG/L) TOT P	ORTHO P	TOT N	INORG N	EXPORT (KG/SQ KM) TOT P	ORTHO P	TOT N	INORG N
ALABAMA												
GANTT RESERVOIR												
0103B1	1	0	23.0	23.1	.018	.005	.805	.215	4.1	1.1	185.1	49.4
GUNTERSVILLE RESERVOIR												
0104A1	1	0	65.8	68.0	.072	.017	1.433	.688	59.4	14.0	1181.7	567.4
0104E1	1	0	93.4	102.3	.042	.012	2.129	1.318	26.6	7.6	1350.5	836.1
0104G1	1	0	115.2	125.6	.051	.010	2.492	1.497	31.0	6.1	1512.9	908.9
0104J1	1	0	57.2	60.9	.044	.011	2.145	1.511	26.5	6.6	1292.1	910.2
0104L1	1	0	18.6	19.3	.027	.007	1.865	1.430	17.7	4.6	1223.3	938.0
HOLT LOCK AND DAM												
0105B1	1	1.077	2.0	2.0	.021	.007	1.235	.736	11.0	3.7	644.3	384.0
0105C1	1	1.875	2.5	2.6	.020	.008	1.314	.774	7.1	2.8	463.5	273.0
0105D1	1	1.427	0	0	.012	.006	.897	.508	6.0	3.0	445.3	252.2
LAY LAKE												
0106C1	1	0	39.7	39.3	.039	.012	.650	.270	21.7	6.7	362.2	150.5
0106D1	1	0	46.3	45.8	.040	.018	.892	.253	23.1	10.4	514.5	145.9
MARTIN LAKE												
0107C1	1	0	24.6	24.7	.021	.008	.450	.116	11.6	4.4	247.5	63.8
0107H1	1	0	25.5	27.3	.045	.017	.691	.150	10.5	4.0	160.8	34.9
MITCHELL LAKE												
0108B1	1	0	33.4	33.8	.032	.012	1.021	.327	20.2	7.6	645.4	206.7
PICKWICK LAKE												
0109C1	1	0	19.2	18.4	.035	.010	.729	.264	14.5	4.1	301.2	109.1
0109D1	1	0	13.0	12.9	.039	.011	.531	.193	16.6	4.7	225.7	82.0
0109K1	1	0	12.8	12.6	.011	.006	.532	.205	8.5	4.6	410.7	158.3
0109M1	1	0	11.5	11.4	.014	.009	.674	.225	6.9	4.4	333.0	111.2
0109Q1	1	0	5.2	5.0	.029	.011	.711	.134	1.6	.6	38.2	7.2
W. F. GEORGE RESERVOIR												
0111B1	1	0	10.2	10.0	.015	.006	.840	.091	6.8	2.7	379.2	41.1
0111C1	1	0	11.4	11.2	.027	.007	.527	.092	9.5	2.5	184.7	32.3
0111J1	1	0	13.0	12.9	.024	.008	.779	.224	102.0	34.0	3311.8	952.3
0111M1	1	0	24.6	24.4	.032	.008	.797	.373	12.7	3.2	317.1	148.4
WEISS LAKE												
0112C1	1	0	10.8	10.5	.014	.006	.655	.137	7.7	3.3	359.6	75.2
0112E1	1	0	4.4	4.4	.030	.009	1.137	.107	15.6	4.7	591.3	55.6
WILSON LAKE												
0114F1	1	0	41.4	41.1	.046	.019	1.713	.893	17.9	7.4	666.0	347.2
LAKE PURDY												
0115B1	1	0	14.7	14.5	.052	.016	1.177	.106	35.0	10.8	791.6	71.3
0115C1	1	0	44.9	44.5	.057	.011	.605	.100	40.5	7.8	430.4	71.1
ARIZONA												
FOOLS HOLLOW LAKE												
0402C1	0	1.015	.1	.1	.067	.019	1.257	.080	.3	.1	4.7	.3

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL[3] LAND USE CATEGORY	GEOLOGY[4]		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	P-COM (%)				
ARIZONA															
RAINBOW LAKE															
04091C	70.73	79.0	7.2	13.4	0	0	.3	.1	75 FOR.	2600	.141	8.6	7.2	67	.543
ARKANSAS															
BEAVER RESERVOIR															
0501B1	27.71	83.8	.8	0	15.4	0	0	0	50 FOR.	1231	.045	31.1	4.5	126	.380
0501D1	39.19	32.3	.3	0	67.0	.2	0	.2	50 AG.	1000	.047	9.5	4.5	126	.524
0501F1	30.61	49.4	1.4	0	49.2	0	0	0	MIXED	1000	.040	12.7	4.5	126	.470
BLUE MOUNTAIN LAKE															
0503D1	28.63	97.3	2.3	0	.4	0	0	0	90 FOR.	1314	.053	23.7	4.5	139	.331
0503E1	30.83	92.0	4.3	0	3.7	0	0	0	75 FOR.	1314	.053	22.8	4.5	139	.388
0503F1	150.28	95.7	2.3	0	2.0	0	0	0	75 FOR.	1314	.053	21.0	4.5	139	1.770
BULL SHOALS RESERVOIR															
0504B1	21.42	88.8	.6	0	10.0	0	.6	0	50 FOR.	1200	.020	24.1	4.5	135	.200
0504C1	41.57	92.5	1.0	0	6.3	0	.2	0	75 FOR.	1200	.020	31.2	4.5	135	.380
0504E1	68.82	60.3	2.4	0	37.3	0	0	0	50 FOR.	1200	.020	20.1	4.5	140	.640
0504F1	343.49	62.1	2.9	0	34.9	.1	0	0	50 FOR.	1200	.020	21.9	4.5	140	3.230
0504G1	79.24	79.9	1.8	1.4	16.1	0	0	.8	50 FOR.	1200	.020	27.1	4.5	128	.690
0504K1	53.71	83.1	.8	0	16.1	0	0	0	50 FOR.	1200	.020	27.4	4.5	128	.490
0504M1	112.73	75.4	.1	0	24.5	0	0	0	50 FOR.	1200	.020	15.7	4.5	128	1.070
0504N1	43.96	73.4	.1	0	26.5	0	0	0	50 FOR.	1200	.020	12.3	4.5	128	.420
0504Q1	32.94	72.9	7.4	.8	18.5	0	0	.4	50 FOR.	1200	.020	15.8	4.5	127	.238
DE GRAY RESERVOIR															
0507B1	5.23	100.0	0	0	0	0	0	0	90 FOR.	1413	.074	7.9	4.5	187	.080
0507C1	13.25	72.5	5.6	0	21.9	0	0	0	50 FOR.	1413	.074	6.6	4.5	187	.200
0507D1	19.90	90.6	5.8	0	3.4	0	0	.2	75 FOR.	1400	.080	21.2	4.5	187	.262
0507E1	12.51	75.1	3.6	.4	20.5	0	0	.4	50 FOR.	1400	.080	14.0	4.5	187	.170
0507F1	18.30	67.3	6.4	6.0	19.4	.4	0	.5	50 FOR.	1300	.040	19.2	4.5	187	.266
LAKE ERLING															
0508B1	19.58	75.3	6.4	0	16.7	1.3	0	.3	50 FOR.	1300	.040	.8	5.0	193	.198
0508C1	45.91	84.1	1.0	0	14.9	0	0	0	50 FOR.	1400	.080	1.1	5.0	193	.467
HAMILTON LAKE															
0510G1	61.89	66.1	.8	6.1	25.6	.2	0	1.2	50 FOR.	1300	.040	15.2	4.5	190	1.230
MILLWOOD RESERVOIR															
0511C1	21.01	74.9	.5	0	24.2	.3	0	.1	50 FOR.	1300	.040	1.3	5.0	182	.320
0511G1	25.64	33.4	1.5	.5	64.4	0	0	.2	50 AG.	1300	.040	5.7	5.0	182	.390
0511H1	20.82	38.7	2.7	0	58.1	0	0	.5	50 AG.	1300	.040	4.7	5.0	182	.320
0511M1	13.42	90.0	1.6	0	8.1	.3	0	0	50 FOR.	1300	.040	9.4	5.0	183	.200
0511P1	19.61	32.6	1.1	3.0	62.7	0	.2	.4	50 AG.	1300	.040	4.8	4.5	183	.300
0511Q1	61.67	51.3	7.5	0	40.8	.4	0	0	50 FOR.	1300	.040	5.2	4.5	183	.910
0511R1	44.05	41.1	1.4	0	57.3	0	0	.2	50 AG.	1300	.040	3.6	4.5	183	.668
0511T1	42.67	39.4	1.5	0	58.7	0	0	.4	50 AG.	1300	.040	5.3	4.5	183	.700
NIMROD LAKE															
0512B1	51.70	97.9	1.0	0	1.1	0	0	0	90 FOR.	1413	.074	16.6	4.5	133	.683
0512C1	25.45	99.3	.7	0	0	0	0	0	90 FOR.	1413	.074	19.0	4.5	133	.363
0512E1	53.85	99.7	.3	0	0	0	0	0	90 FOR.	1413	.074	20.8	4.5	133	.730
0512F1	41.34	98.5	1.5	0	0	0	0	0	90 FOR.	1413	.074	22.8	4.5	133	.560

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
ARIZONA												
RAINBOW LAKE												
04091C	0	.777	0	0	.061	.018	.767	.066	14.8	7.5	240.7	13.3
ARKANSAS												
BEAVER RESERVOIR												
0501B1	2	0	11.9	11.7	.024	.017	.644	.141	10.4	7.4	278.5	61.0
0501D1	2	0	78.1	81.4	.031	.021	1.800	1.117	13.1	8.9	759.0	471.0
0501F1	2	0	59.9	62.3	.038	.019	1.243	.654	18.4	9.2	601.9	316.7
BLUE MOUNTAIN LAKE												
0503D1	2	1.020	.4	.4	.027	.009	.840	.053	9.8	3.3	306.3	19.3
0503E1	2	1.159	2.2	2.3	.020	.008	.548	.049	7.9	3.2	217.5	19.4
0503F1	2	.752	1.2	1.3	.019	.008	.461	.071	7.1	3.0	171.2	26.4
BULL SHOALS RESERVOIR												
0504B1	2	0	3.7	3.7	.011	.006	.268	.074	3.2	1.8	78.9	21.8
0504C1	2	1.448	2.3	2.3	.009	.006	.294	.121	2.6	1.7	84.8	34.9
0504E1	2	0	16.0	15.9	.010	.006	.586	.313	2.9	1.8	171.9	91.8
0504F1	2	0	15.0	14.9	.015	.006	.546	.363	4.4	1.8	161.9	107.6
0504G1	2	0	6.4	6.4	.009	.006	.246	.109	2.5	1.6	67.6	29.9
0504K1	2	0	5.4	5.4	.012	.008	.707	.425	3.5	2.3	203.4	122.3
0504M1	2	0	8.4	8.3	.015	.007	.587	.244	1.2	.9	53.5	29.1
0504N1	2	0	9.0	8.9	.010	.008	.455	.248	11.5	5.4	450.6	187.3
0504O1	2	0	6.5	6.3	.011	.005	.487	.249	2.5	1.1	111.0	56.7
DE GRAY RESERVOIR												
0507B1	2	1.172	0	0	.021	.008	.191	.043	10.1	3.9	92.1	20.7
0507C1	2	0	8.5	8.7	.020	.008	.354	.095	9.5	3.8	168.5	45.2
0507D1	2	1.446	1.3	1.4	.013	.006	.149	.022	5.4	2.5	61.9	9.1
0507E1	2	0	8.0	8.1	.014	.007	.302	.079	6.0	3.0	129.4	33.9
0507F1	2	0	7.6	7.7	.015	.008	.218	.094	6.9	3.7	99.9	43.1
LAKE ERLING												
0508B1	2	0	8.4	8.7	.098	.036	1.067	.078	31.3	11.5	340.3	24.9
0508C1	2	0	7.4	7.8	.096	.044	.803	.085	30.8	14.1	257.6	27.3
HAMILTON LAKE												
0510G1	2	0	14.0	13.7	.019	.010	.231	.068	11.9	6.3	144.8	42.6
MILLWOOD RESERVOIR												
0511C1	2	0	10.7	10.8	.027	.008	.550	.067	13.0	3.8	264.2	32.2
0511G1	2	0	49.8	49.5	.029	.008	.809	.310	13.9	3.8	388.1	148.7
0511H1	2	0	40.4	44.6	.047	.018	.495	.076	22.8	8.7	239.9	36.8
0511M1	2	0	5.6	6.2	.055	.017	.522	.181	25.8	8.0	245.3	85.1
0511P1	2	0	73.7	85.1	.043	.016	.612	.287	20.7	7.7	295.3	138.5
0511O1	2	0	48.0	55.4	.046	.015	.493	.167	21.4	7.0	229.4	77.7
0511R1	2	0	67.4	77.8	.068	.021	.825	.325	32.5	10.0	394.5	155.4
0511T1	2	0	69.0	79.7	.046	.016	.703	.302	23.8	8.3	363.7	156.2
NIMROD LAKE												
0512B1	2	1.336	.5	.6	.016	.008	.467	.058	6.7	3.3	194.6	24.2
0512C1	2	1.646	0	0	.017	.007	.606	.048	7.6	3.1	272.6	21.6
0512E1	2	1.457	0	0	.016	.008	.509	.047	6.8	3.4	217.6	20.1
0512F1	2	1.040	0	0	.025	.009	.375	.113	10.7	3.8	160.2	48.3

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL LAND USE CATEGORY[3]	GEOLOGY[4]		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	P-COM (%)				
ARKANSAS															
NORFOLK LAKE															
0513B1	18.43	36.7	.6	27.5	34.2	.5	0	.5	MIXED	1200	.020	8.2	4.5	117	.190
0513C1	22.31	71.6	4.6	14.2	9.4	0	0	.2	50 FOR.	1200	.020	15.2	4.5	117	.234
0513D1	23.27	80.2	14.3	3.9	1.6	0	0	0	75 FOR.	1200	.020	14.5	4.5	117	.237
0513E1	26.14	81.7	6.6	3.4	8.1	0	0	.2	50 FOR.	1200	.020	12.5	4.5	117	.256
0513J1	75.02	57.6	2.0	0	40.4	0	0	0	50 FOR.	1200	.020	13.4	4.5	120	.550
0513O1	50.06	86.6	1.5	0	11.9	0	0	0	50 FOR.	1200	.020	18.9	4.5	127	.350
OUACHITA LAKE															
0514B1	22.59	97.9	.5	0	1.3	0	0	.3	90 FOR.	1413	.074	27.2	4.5	201	.275
0514C1	27.34	95.9	1.6	1.4	.7	0	0	.4	90 FOR.	1413	.074	20.6	4.5	201	.337
0514H1	10.31	97.9	1.6	.2	.3	0	0	0	90 FOR.	1314	.060	17.4	4.5	190	.130
TABLE ROCK RESERVOIR															
0515B1	48.45	57.6	.4	5.1	36.7	.2	0	0	50 FOR.	1200	.020	27.3	4.5	137	.269
0515C1	45.95	43.2	6.6	13.0	36.1	.9	0	.2	MIXED	1200	.020	26.6	4.5	137	.190
0515F1	74.58	90.9	.4	0	8.7	0	0	0	50 FOR.	1211	.036	23.4	4.5	137	.450
0515G1	147.34	70.5	.5	0	28.2	.3	0	.5	50 FOR.	1211	.036	25.7	4.5	137	.990
0515H1	10.31	76.5	1.2	0	21.8	.5	0	0	50 FOR.	1000	.042	27.7	4.5	143	.349
CALIFORNIA															
BOCA LAKE															
0602B1	24.38	61.1	38.9	0	0	0	0	0	50 FOR.	1500	0	11.5	5.5	65	.367
0602C1	9.12	31.5	68.5	0	0	0	0	0	50 CL.	2626	.141	7.0	5.5	65	.139
CASITAS RESERVOIR															
0604A2	33.81	58.0	41.7	.2	0	0	0	.1	50 FOR.	1500	0	55.1	7.5	57	.191
0604B1	24.92	54.6	41.0	1.5	2.7	0	0	.2	50 FOR.	1500	0	52.6	7.5	57	.139
DON PEDRO RESERVOIR															
0606A3	176.82	73.1	25.0	0	0	1.9	0	0	50 FOR.	1000	.030	26.0	7.5	44	2.390
0606B1	10.23	49.6	50.1	0	0	0	0	.3	50 CL.	1523	.120	19.2	7.5	44	.011
0606C1	22.75	30.5	10.2	50.2	8.4	0	0	.7	50 RAF.	3700	.141	29.4	7.5	44	.146
LAKE HENNESSEY															
06091G	8.84	46.8	1.6	0	51.6	0	0	0	50 AG.	2415	.141	23.8	7.5	84	.017
0609C1	43.55	67.5	20.2	1.5	10.8	0	0	0	50 FOR.	2018	.127	31.4	7.5	113	.266
0609D1	34.27	70.1	19.8	0	10.1	0	0	0	50 FOR.	2018	.127	36.5	7.5	94	.354
0609H1	10.74	45.4	24.1	6.4	24.1	0	0	0	MIXED	1800	0	30.9	7.5	94	.016
0609J1	8.41	52.8	30.9	0	16.3	0	0	0	50 FOR.	1820	.105	29.6	7.5	94	.021
0609K1	11.59	51.8	20.8	0	27.2	0	0	.2	50 FOR.	2033	.138	26.0	7.5	94	.029
LAKE HENSHAW															
0610D1	66.00	32.5	54.7	12.0	.4	.4	0	0	50 CL.	2032	.089	32.2	7.7	76	.167
0610E1	15.22	47.7	31.5	20.2	.3	0	.3	0	MIXED	2131	.100	28.6	7.7	76	.009
IRON GATE RESERVOIR															
0611C1	38.79	77.9	11.4	10.5	0	.2	0	0	75 FOR.	2400	.141	10.8	6.5	54	1.390
0611D1	51.38	29.9	51.2	18.3	.6	0	0	0	50 CL.	2400	.141	33.6	6.5	54	.436
0611E1	46.66	18.4	77.8	1.4	2.4	0	0	0	75 CL.	2400	.141	27.6	6.5	54	.607

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
ARKANSAS												
NORFOLK LAKE												
0513B1	2	0	13.0	13.0	.017	.008	1.307	.987	5.5	2.6	424.9	320.9
0513C1	2	1.612	2.4	2.4	.012	.005	.670	.379	4.0	1.7	221.6	125.4
0513D1	2	1.564	.6	.6	.012	.008	.656	.337	3.9	2.6	210.7	108.2
0513E1	2	0	3.1	3.0	.010	.006	.716	.325	3.1	1.9	221.1	100.4
0513J1	2	0	14.3	13.9	.011	.006	.860	.425	2.5	1.4	198.8	98.3
0513[illegible]1	2	0	4.3	4.2	.012	.007	1.113	.711	2.6	1.5	245.4	156.8
OUACHITA LAKE												
0514B1	2	1.467	.9	.9	.026	.016	.248	.035	10.0	6.1	95.2	13.4
0514C1	2	1.178	.5	.5	.018	.013	.345	.042	7.0	5.1	134.1	16.3
0514H1	2	1.836	.2	.2	.017	.010	.581	.051	6.8	4.0	231.0	20.3
TABLE ROCK RESERVOIR												
0515H1	2	0	28.5	26.2	.012	.011	1.618	.732	2.1	1.9	283.3	128.2
0515C1	2	0	21.2	20.5	.017	.010	2.034	1.044	2.2	1.3	265.2	136.1
0515F1	2	0	6.2	7.2	.015	.006	.974	.087	2.9	1.1	185.3	16.6
0515G1	2	0	20.2	23.3	.025	.015	2.016	.996	5.3	3.2	427.2	211.0
0515H1	2	0	21.1	20.4	.011	.008	.954	.315	1.8	1.3	156.9	51.8
CALIFORNIA												
BOCA LAKE												
0602B1	0	0	0	0	.019	.009	.439	.036	9.0	4.3	208.4	17.1
0602C1	0	0	0	0	.061	.042	.887	.206	29.3	20.2	426.3	99.0
CASITAS RESERVOIR												
0604A2	0	0	0	0	.012	.007	.495	.093	2.1	1.2	88.2	16.6
0604B1	0	0	3.5	3.2	.014	.012	1.222	.104	2.5	2.1	215.0	18.3
DON PEDRO RESERVOIR												
0606A3	0	0	0	0	.027	.010	.910	.056	11.5	4.3	387.9	23.9
0606B1	0	0	0	0	.056	.033	1.822	.585	1.9	1.1	61.8	19.8
0606C1	0	0	27.8	28.0	.026	.007	1.601	.218	5.3	1.4	324.0	44.1
LAKE HENNESSEY												
06091G	0	0	83.3	83.7	.206	.147	2.726	1.564	12.5	8.9	165.3	94.9
0609C1	0	0	17.4	17.5	.045	.028	1.239	.276	8.7	5.4	238.7	53.2
0609D1	0	0	16.3	16.4	.048	.025	1.174	.158	15.6	8.1	382.4	51.5
0609H1	0	0	38.9	39.1	.054	.033	1.587	.766	2.5	1.6	74.6	36.0
0609J1	0	0	26.3	26.4	.049	.030	1.478	.700	3.9	2.4	116.4	55.1
0609K1	0	0	43.9	44.1	.082	.048	1.803	1.086	6.5	3.8	142.3	85.7
LAKE HENSHAW												
0610D1	0	0	.9	.8	.029	.022	1.403	.046	2.3	1.8	112.0	3.7
0610E1	0	0	.7	.7	.020	.013	.860	.039	.4	.2	16.0	.7
IRON GATE RESERVOIR												
0611C1	0	.945	0	0	.033	.024	.693	.060	37.3	27.1	783.1	67.8
0611D1	0	0	2.2	2.2	.042	.032	1.214	.057	11.2	8.6	324.9	15.3
0611E1	0	0	0	0	.036	.025	1.117	.191	14.8	10.3	458.3	78.4

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS [1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES [2] FOR	CL	RA	AG	URB	WET	OTHER	OVERALL [3] LAND USE CATEGORY	GEOLOGY [4] ORIGIN	P-COM (%)	MEAN SLOPE (%)	PH [5]	AVE ANN PRECIP. (CM)	FLOW [6] (CM/SQ KM)
CALIFORNIA															
LAKE MENDOCINO															
0616B1	46.74	60.4	18.3	16.3	5.0	0	0	0	50 FOR.	1100	.052	40.3	7.2	105	1.901
NICASIO RESERVOIR															
0617A2	31.27	52.2	12.8	33.1	1.3	.4	0	.2	50 FOR.	2000	.100	38.1	7.2	120	.426
0617B1	22.28	49.3	19.7	26.4	4.6	0	0	0	MIXED	2000	.100	48.8	7.2	120	.307
LOWER OTAY RESERVOIR															
0618G1	16.38	89.1	8.8	2.1	0	0	0	0	75 FOR.	3700	.141	38.7	7.0	33	.029
LAKE PILLSBURY															
0619B1	225.88	94.6	5.4	0	0	0	0	0	90 FOR.	1030	.040	30.5	7.2	130	4.720
0619C1	8.91	76.5	23.5	0	0	0	0	0	75 FOR.	1500	0	27.7	5.5	130	.215
0619D1	32.68	80.4	19.6	0	0	0	0	0	75 FOR.	1500	0	44.9	7.2	130	.775
0619E2	33.17	91.2	8.4	0	.4	0	0	0	90 FOR.	1800	0	28.5	7.2	130	.771
SANTA MARGARITA LAKE															
0620A2	203.31	31.6	51.3	13.0	3.9	0	0	.2	50 CL.	1800	0	29.4	7.2	62	.521
0620C1	24.80	8.4	37.6	43.8	10.0	0	0	.2	MIXED	1522	.078	38.3	7.2	62	.017
LAKE SHASTA															
0621B1	36.81	72.2	27.8	0	0	0	0	0	50 FOR.	3737	.141	48.0	5.5	174	1.281
0621C1	35.19	93.2	6.5	0	.3	0	0	0	90 FOR.	1024	.080	43.2	5.5	174	.854
0621E1	28.45	94.8	5.2	0	0	0	0	0	90 FOR.	1800	0	52.8	5.5	174	.990
0621F1	157.64	86.5	13.5	0	0	0	0	0	75 FOR.	1024	.080	45.4	5.5	174	6.310
0621H1	13.68	96.8	3.2	0	0	0	0	0	90 FOR.	1800	0	55.8	5.5	174	.476
0621J1	25.03	89.4	10.6	0	0	0	0	0	75 FOR.	1800	0	42.8	5.5	174	.871
SHAVER LAKE															
0622C1	3.34	69.9	11.9	0	7.0	0	0	11.2	50 FOR.	2200	.087	20.3	7.5	79	.060
TULLOCH RESERVOIR															
0624B1	42.91	15.7	0	75.3	8.5	0	0	.5	75 RA.	3723	.155	15.9	7.5	69	.386
0624C1	48.51	14.5	20.3	64.3	0	.8	0	.1	50 RAF.	3040	.107	21.6	7.5	69	.242
UPPER TWIN LAKES															
0625A2	54.40	35.2	20.8	0	0	0	0	44.0	MIXED	2237	.114	50.9	5.5	51	.890
LOWER TWIN LAKES															
0626B1	1.07	21.3	78.7	0	0	0	0	0	75 CL.	2215	.087	43.2	7.5	41	.016
COLORADO															
BLUE MESA RESERVOIR															
0803F1	66.02	63.1	19.1	17.7	0	0	0	.1	50 FOR.	2526	.089	30.6	7.7	24	.463
CHERRY CREEK RESERVOIR															
0804E1	20.09	0	4.4	12.0	82.5	.3	0	.8	75 AG.	1500	0	6.7	7.2	50	.008
DILLON RESERVOIR															
0806G1	16.26	63.8	36.2	0	0	0	0	0	50 FOR.	3114	.074	36.5	5.5	31	.173
0806H1	9.90	53.5	46.5	0	0	0	0	0	50 FOR.	3100	.070	32.6	5.5	31	.105
GRAND LAKE															
0807B1	71.71	48.9	48.1	0	0	0	.4	2.6	MIXED	3122	.079	37.1	7.7	34	1.441
GREEN MOUNTAIN RESERVOIR															
0808C1	21.88	68.5	17.1	11.5	1.9	0	.3	.7	50 FOR.	4000	.070	23.1	5.5	32	.131

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
CALIFORNIA												
LAKE MENDOCINO												
0616B1	0	0	6.1	7.3	.082	.019	.931	.190	105.2	24.4	1194.1	243.7
NICASIO RESERVOIR												
0617A2	0	0	6.0	6.2	.047	.028	1.474	.302	20.2	12.0	633.3	129.7
0617B1	0	0	20.3	21.0	.046	.023	1.684	.413	20.0	10.0	731.8	179.5
LOWER OTAY RESERVOIR												
0618G1	90	1.867	0	0	.037	.012	2.700	1.420	2.1	.7	150.7	79.3
LAKE PILLSBURY												
0619B1	0	1.481	0	0	.026	.014	.534	.058	17.1	9.2	351.9	38.2
0619C1	0	1.412	0	0	.052	.024	.845	.051	39.6	18.3	643.0	38.8
0619D1	0	1.628	0	0	.061	.018	.653	.028	45.6	13.5	488.4	20.9
0619E2	0	.898	.2	.2	.036	.016	1.045	.030	26.4	11.7	766.0	22.0
SANTA MARGARITA LAKE												
0620A2	0	0	3.2	3.2	.039	.021	.259	.058	3.2	1.7	20.9	4.7
0620C1	0	0	8.1	8.1	.241	.140	.720	.065	5.2	3.0	15.6	1.4
LAKE SHASTA												
0621B1	0	0	0	0	.014	.006	.587	.066	15.4	6.6	644.2	72.4
0621C1	0	.780	0	0	.020	.011	.982	.039	15.3	8.4	751.5	29.8
0621E1	0	.667	0	0	.018	.009	1.365	.080	19.8	9.9	1497.9	87.8
0621F1	0	.851	0	0	.019	.011	.876	.047	24.0	13.9	1105.8	59.3
0621H1	0	.676	0	0	.022	.016	1.153	.055	24.1	17.6	1265.2	60.4
0621J1	0	.643	0	0	.018	.012	.765	.067	19.8	13.2	839.5	73.5
SHAVER LAKE												
0622C1	0	0	4.7	4.6	.019	.019	.740	.071	10.8	10.8	419.2	40.2
TULLOCH RESERVOIR												
0624B1	0	0	28.1	28.3	.054	.047	1.515	.369	15.3	13.3	429.8	104.7
0624C1	0	0	0	0	.022	.011	1.473	.640	3.5	1.7	231.7	100.7
UPPER TWIN LAKES												
0625A2	0	0	0	0	.021	.006	.767	.074	10.8	3.1	395.7	38.2
LOWER TWIN LAKES												
0626B1	0	0	0	0	.018	.007	1.142	.170	8.5	3.3	538.5	80.2
COLORADO												
BLUE MESA RESERVOIR												
0803F1	0	0	0	0	.067	.047	.893	.081	14.8	10.4	197.5	17.9
CHERRY CREEK RESERVOIR												
0804E1	0	1.691	11.1	11.2	.044	.019	.656	.049	.6	.2	8.2	.6
DILLON RESERVOIR												
0806G1	0	0	0	0	.010	.006	.259	.037	3.4	2.0	86.9	12.4
0806H1	0	0	0	0	.019	.005	.258	.063	6.4	1.7	86.3	21.1
GRAND LAKE												
0807B1	0	0	0	0	.011	.007	.461	.047	7.0	4.4	292.1	29.8
GREEN MOUNTAIN RESERVOIR												
0808C1	0	0	.7	.7	.075	.046	.481	.054	14.2	8.7	90.8	10.2

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL LAND USE CATEGORY[3]	GEOLOGY[4]		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	P-COM (%)				
COLORADO															
NAVAJO RESERVOIR															
0812F1	18.67	8.4	88.5	0	2.4	0	0	.7	75 CL.	1500	0	27.4	5.5	40	.052
0812H1	17.72	16.1	83.9	0	0	0	0	0	75 CL.	1413	.072	28.5	5.5	40	.040
SHADOW MTN. RESERVOIR															
0813E1	19.96	71.1	28.3	0	0	0	.1	.5	50 FOR.	3122	.079	40.1	5.5	55	.169
0813F1	3.35	97.2	2.8	0	0	0	0	0	90 FOR.	3100	.070	28.9	5.5	55	.028
CONNECTICUT															
ASPINOOK POND															
0901C1	2.33	87.4	3.1	0	7.7	1.3	.3	.2	50 FOR.	3839	.150	6.6	4.5	97	.050
0901F1	22.74	82.5	3.8	0	8.8	.7	3.7	.5	50 FOR.	3236	.064	7.2	4.5	97	.428
HANOVER POND															
0905B1	12.85	46.5	11.3	0	.3	40.0	1.6	.3	MIXED	1310	.060	11.4	4.5	94	.260
LAKE ZOAR															
0910B1	1.71	72.5	13.2	0	14.3	0	0	0	50 FOR.	3632	.064	16.0	4.5	97	.040
0910C1	24.81	74.3	9.7	0	6.2	8.2	.9	.7	50 FOR.	3438	.141	12.0	4.5	94	.550
0910D1	4.82	40.8	17.5	0	39.1	1.1	1.5	0	MIXED	3438	.141	12.8	4.5	91	.100
0910F1	2.98	69.2	7.2	0	13.6	9.6	0	.4	50 FOR.	3438	.141	15.1	4.5	89	.060
0910G1	12.02	68.7	7.3	0	22.5	.4	.2	.9	50 FOR.	3438	.141	11.8	4.5	91	.260
0910H1	12.28	40.2	17.7	0	11.9	28.1	1.8	.3	MIXED	3332	.121	11.0	4.5	91	.230
DELAWARE															
KILLEN POND															
1002A2	37.40	36.0	1.8	0	61.0	.8	.4	0	50 AG.	1811	.040	1.3	5.5	117	.530
1002B1	2.28	23.4	0	0	76.6	0	0	0	75 AG.	1811	.040	1.2	4.5	117	.040
SILVER LAKE															
1008B1	5.02	6.1	.5	0	92.1	.9	0	.4	90 AG.	1815	0	1.9	4.5	114	.080
WILLIAMS POND															
1009C1	4.01	29.0	10.1	0	59.4	1.5	0	0	50 AG.	1811	.040	.6	4.5	117	.010
GEORGIA															
ALLATOONA RESERVOIR															
1301F1	46.54	96.2	1.8	0	1.8	0	0	.2	90 FOR.	1036	.063	20.0	4.5	132	.660
CHATUGE LAKE															
1303A1	15.44	91.3	.5	0	8.2	0	0	0	50 FOR.	2310	.105	42.4	4.5	152	.360
1303C1	23.34	89.5	2.4	0	8.1	0	0	0	50 FOR.	1310	.040	43.4	4.5	163	.540
CLARK HILL RESERVOIR															
1304C1	31.13	80.4	9.3	0	10.1	0	0	.2	50 FOR.	2222	.087	7.7	4.5	117	.290
1304F1	71.92	70.3	3.8	0	25.2	.7	0	0	50 FOR.	2236	.087	9.0	4.5	117	.650
1304J1	43.38	67.9	2.5	0	29.5	0	0	.1	50 FOR.	2400	.141	6.9	4.5	117	.360
1304K1	25.64	62.4	2.7	0	33.8	.8	0	.3	50 FOR.	2400	.141	8.3	4.5	117	.230
JACKSON LAKE															
1309A1	188.84	59.3	2.1	0	37.6	.6	.1	.3	50 FOR.	3632	.087	6.3	4.5	119	2.580

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
COLORADO												
NAVAJO RESERVOIR												
0812F1	90	0	.4	.4	.026	.008	1.333	.052	2.3	.7	117.1	4.6
0812H1	0	0	0	0	.015	.006	.831	.049	1.1	.4	59.2	3.5
SHADOW MTN. RESERVOIR												
0813E1	0	0	0	0	.022	.006	.657	.087	5.9	1.6	175.4	23.2
0813F1	0	.994	0	0	.019	.009	.451	.060	5.0	2.4	118.9	15.8
CONNECTICUT												
ASPINOOK POND												
0901C1	1	0	17.2	16.4	.041	.009	1.256	.440	27.7	6.1	850.0	297.8
0901F1	1	0	19.6	18.8	.021	.010	.959	.291	12.5	5.9	569.2	172.7
HANOVER POND												
0905B1	1	0	.3	.3	.045	.022	1.664	.995	28.7	14.0	1061.8	634.9
LAKE ZOAR												
0910B1	1	0	13.7	13.5	.021	.011	.532	.295	15.5	8.1	392.4	217.6
0910C1	1	0	5.9	5.8	.032	.009	.956	.279	22.4	6.3	668.3	195.1
0910D1	1	0	37.4	36.8	.031	.008	.978	.416	20.3	5.2	639.9	272.2
0910F1	1	0	15.2	14.6	.018	.010	1.126	.721	11.4	6.3	715.0	457.8
0910G1	1	0	25.1	24.2	.044	.020	1.416	.758	28.0	12.7	965.9	517.1
0910H1	1	0	11.4	11.2	.034	.012	1.069	.653	20.1	7.1	631.4	385.7
DELAWARE												
KILLEN POND												
1002A2	1	0	16.3	17.2	.261	.192	3.322	2.523	116.6	85.8	1484.6	1127.5
1002B1	1	.880	20.5	21.6	.126	.057	2.743	1.836	69.7	31.5	1517.6	1015.8
SILVER LAKE												
1008B1	1	.520	26.9	26.5	.047	.020	7.610	7.406	23.6	10.1	3824.5	3722.0
WILLIAMS POND												
1009C1	1	0	85.2	109.0	.083	.030	1.382	.601	6.5	2.4	108.7	47.3
GEORGIA												
ALLATOONA RESERVOIR												
1301F1	1	1.271	1.9	2.2	.024	.006	.401	.041	10.7	2.7	179.3	18.3
CHATUGE LAKE												
1303A1	1	0	17.0	15.2	.028	.006	.458	.136	20.6	4.4	336.8	100.0
1303C1	1	0	16.8	15.1	.038	.006	.458	.130	27.7	4.4	334.2	94.9
CLARK HILL RESERVOIR												
1304C1	1	0	2.1	2.1	.025	.017	.532	.164	7.3	5.0	156.3	48.2
1304F1	1	0	32.3	31.4	.026	.010	.951	.138	7.4	2.9	271.1	39.3
1304J1	1	0	39.9	37.6	.029	.012	.818	.090	7.6	3.1	214.1	23.6
1304K1	1	0	46.9	43.6	.036	.017	1.189	.191	10.2	4.8	336.4	54.0
JACKSON LAKE												
1309A1	1	0	30.2	29.9	.032	.008	.711	.232	13.8	3.4	306.3	100.0

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES							OVERALL LAND USE CATEGORY[3]	GEOLOGY		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL[2]	RA	AG	URB	WET	OTHER		ORIGIN	[4] P-COM (%)				
GEORGIA															
SIDNEY LANIER LAKE															
1310C1	63.56	61.5	1.8	0	36.6	.1	0	0	50 FOR.	1310	.040	15.4	4.5	152	1.770
1310D1	53.54	53.4	.5	0	45.6	.3	.1	.1	50 FOR.	1310	.040	12.3	4.5	157	1.040
1310E1	43.15	51.5	2.0	0	45.0	1.4	0	.1	50 FOR.	1310	.040	14.2	4.5	163	.800
NOTTLEY RESERVOIR															
1311C1	71.77	73.9	1.9	0	24.2	0	0	0	50 FOR.	1310	.040	17.8	4.5	135	1.370
1311D1	29.84	82.0	.8	0	17.2	0	0	0	50 FOR.	1310	.040	27.4	4.5	135	.530
SEMINOLE LAKE															
1312D1	55.43	67.7	4.0	0	27.1	0	.6	.6	50 FOR.	1012	.045	4.7	4.5	132	.620
BLUE RIDGE LAKE															
1316A1	9.40	85.9	2.7	0	11.4	0	0	0	50 FOR.	1310	.040	31.1	4.5	132	.270
1316C1	36.36	83.4	1.3	0	15.3	0	0	0	50 FOR.	1310	.040	25.6	4.5	132	1.050
1316D1	10.23	86.0	2.5	0	11.5	0	0	0	50 FOR.	1310	.040	20.8	4.5	132	.300
1316E1	16.96	96.0	.8	0	3.2	0	0	0	75 FOR.	3131	.030	35.5	4.5	132	.490
BURTON LAKE															
1318B1	16.14	98.0	0	0	2.0	0	0	0	75 FOR.	1310	.040	34.3	4.5	165	.550
1318C1	20.33	99.4	0	0	.6	0	0	0	90 FOR.	1310	.040	38.0	4.5	165	.680
1318D1	17.25	99.2	0	0	.8	0	0	0	90 FOR.	1310	.040	39.9	4.5	165	.590
1318E1	14.71	99.1	0	0	.9	0	0	0	90 FOR.	1310	.040	36.6	4.5	165	.500
HIGH FALLS POND															
1319B1	99.30	54.9	3.5	0	40.7	.2	.2	.5	50 FOR.	3233	.088	6.8	4.5	122	1.420
IDAHO															
CASCADE RESERVOIR															
1602E1	12.23	66.7	29.0	0	0	0	0	4.3	50 FOR.	2126	.167	24.1	6.5	46	.186
COEUR D'ALENE LAKE															
16031L	15.85	2.1	0	0	97.9	0	0	0	90 AG.	1031	0	4.4	5.0	52	.032
16031M	52.92	13.4	1.2	0	85.4	0	0	0	75 AG.	2600	.244	9.1	5.0	68	.106
16031N	23.45	20.4	2.8	0	76.8	0	0	0	75 AG.	2610	.128	9.5	5.0	68	.025
16031P	62.64	17.0	3.8	0	79.2	0	0	0	75 AG.	1031	0	8.1	5.0	52	.125
1603C1	153.99	88.9	7.4	0	3.7	0	0	0	75 FOR.	1500	0	35.7	5.0	68	1.479
1603H1	68.77	60.2	12.0	.7	26.9	0	.2	0	50 FOR.	2621	.192	20.2	5.0	68	.665
1603J1	38.94	44.4	12.6	4.2	38.8	0	0	0	MIXED	2621	.192	23.2	5.0	68	.316
1603K1	37.69	75.7	15.1	4.9	4.3	0	0	0	75 FOR.	2126	.167	30.2	5.0	68	.196
DWORSHAK RESERVOIR															
1604C1	17.06	84.9	15.1	0	0	0	0	0	75 FOR.	2600	.244	14.8	5.0	94	.489
1604D1	26.38	90.6	9.4	0	0	0	0	0	90 FOR.	2635	.194	23.0	5.0	94	.805
1604E1	24.87	99.3	.7	0	0	0	0	0	90 FOR.	1021	.087	39.6	5.0	94	.759
1604F1	161.50	92.6	7.1	0	0	0	0	.3	90 FOR.	2135	.130	24.5	6.5	89	4.900
1604G1	332.76	92.8	7.1	0	0	0	.1	0	90 FOR.	1021	.084	36.7	5.5	94	11.000
1604J1	79.64	85.5	14.5	0	0	0	0	0	75 FOR.	1000	.040	44.2	5.0	89	2.430
HAYDEN LAKE															
1606A2	72.79	90.6	7.0	0	2.2	0	0	.2	75 FOR.	1021	.084	31.0	5.0	68	.910
1606B1	12.26	89.4	9.7	0	.7	0	0	.2	75 FOR.	1021	.084	33.5	5.0	68	.152
1606C1	21.59	84.1	13.4	0	2.5	0	0	0	75 FOR.	1021	.084	28.9	5.0	68	.252

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
GEORGIA												
SIDNEY LANIER LAKE												
1310C1	1	0	204.8	222.3	.072	.030	.931	.465	63.2	26.3	817.6	408.4
1310D1	1	0	233.5	261.9	.055	.020	1.072	.626	33.7	12.3	656.7	383.5
1310E1	1	0	230.4	258.4	.062	.016	1.295	.679	36.2	9.4	757.2	397.0
NOTTLEY RESERVOIR												
1311C1	1	0	41.4	38.5	.037	.009	.619	.185	22.3	5.4	372.6	111.4
1311D1	1	0	38.5	35.0	.035	.010	.759	.110	19.6	5.6	425.1	61.6
SEMINOLE LAKE												
1312D1	1	0	16.5	20.5	.106	.047	.794	.098	37.4	16.6	280.1	34.6
BLUE RIDGE LAKE												
1316A1	1	0	13.5	13.1	.018	.006	.769	.174	16.3	5.4	696.6	157.6
1316C1	1	0	18.1	17.6	.031	.007	.487	.108	28.2	6.4	443.5	98.4
1316D1	1	0	13.6	13.2	.046	.007	.729	.070	42.5	6.5	674.2	64.7
1316E1	1	1.200	9.8	11.4	.010	.007	.470	.043	9.1	6.4	428.2	39.2
BURTON LAKE												
1318B1	1	1.230	3.3	3.8	.008	.005	.422	.080	8.6	5.4	453.5	86.0
1318C1	1	1.190	1.0	1.1	.015	.010	.466	.066	15.8	10.5	491.5	69.6
1318D1	1	1.190	1.3	1.5	.009	.005	.342	.052	9.7	5.4	368.9	56.1
1318E1	1	1.370	1.5	1.7	.008	.005	.353	.082	8.6	5.4	378.4	87.9
HIGH FALLS POND												
1319B1	1	0	38.7	38.6	.025	.007	.522	.227	11.3	3.2	235.4	102.4
IDAHO												
CASCADE RESERVOIR												
1602E1	0	.760	0	0	.034	.017	.435	.083	16.3	8.2	208.6	39.8
COEUR D'ALENE LAKE												
1603IL	90	.656	15.1	14.8	.170	.110	7.690	6.582	10.8	7.0	489.6	419.1
1603IM	0	.531	13.1	13.1	.192	.100	3.307	1.970	12.1	6.3	208.9	124.4
1603IN	0	.626	11.1	11.0	.241	.106	3.151	2.056	8.1	3.6	105.9	69.1
1603IP	0	.407	11.3	11.1	.173	.048	3.384	1.993	10.9	3.0	213.0	125.4
1603C1	0	0	.6	.6	.018	.011	.580	.077	5.5	3.3	175.7	23.3
1603H1	0	0	4.1	4.1	.052	.030	1.842	.829	15.9	9.1	561.7	252.8
1603J1	0	0	5.9	5.9	.052	.037	1.026	.527	13.3	9.5	262.6	134.9
1603K1	0	.567	.7	.7	.034	.021	.471	.061	5.6	3.4	77.2	10.0
DWORSHAK RESERVOIR												
1604C1	0	0	0	0	.031	.016	.578	.058	28.0	14.5	522.5	52.4
1604D1	0	1.561	0	0	.029	.018	.480	.032	27.9	17.3	461.9	30.8
1604E1	0	1.643	0	0	.024	.009	.393	.029	23.1	8.7	378.2	27.9
1604F1	0	1.540	0	0	.036	.030	.303	.029	34.4	28.7	289.9	27.7
1604G1	0	1.373	0	0	.017	.013	.417	.033	17.7	13.6	434.7	34.4
1604J1	0	1.786	0	0	.011	.005	.469	.058	10.6	4.8	451.3	55.8
HAYDEN LAKE												
1606A2	0	1.325	.3	.3	.016	.008	.479	.059	6.3	3.2	188.8	23.3
1606B1	0	1.050	.1	.1	.019	.012	1.082	.041	7.4	4.7	423.0	16.0
1606C1	0	1.219	.4	.4	.030	.012	.811	.032	11.0	4.4	298.5	11.8

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES							OVERALL LAND USE CATEGORY[3]	GEOLOGY		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL[2]	RA	AG	URB	WET	OTHER		ORIGIN	[4] P-COM (%)				
IDAHO															
ISLAND PARK RESERVOIR															
1607B1	38.20	82.8	15.5	1.5	0	0	0	.2	75 FOR.	2526	.150	28.8	5.5	86	.520
MAGIC RESERVOIR															
1609D1	20.05	2.4	43.9	42.9	10.7	0	0	.1	MIXED	2421	.167	14.6	6.5	41	.035
PALISADES RESERVOIR															
1610B1	202.27	64.0	36.0	0	0	0	0	0	50 FOR.	1010	.030	51.8	5.5	57	2.210
1610C1	17.39	65.7	33.9	0	0	0	.4	0	50 FOR.	1818	.040	52.3	5.5	57	.168
1610D1	149.79	60.8	38.8	0	0	0	0	.4	50 FOR.	1818	.040	61.9	5.5	57	1.960
1610E1	100.36	44.2	53.2	.4	.2	0	0	2.0	50 CL.	1000	.030	56.3	5.5	57	.387
LOWER PAYETTE															
1611B1	12.55	65.9	33.1	0	0	0	1.0	0	50 FOR.	2100	.115	24.2	5.0	78	.289
1611C1	10.93	71.8	28.2	0	0	0	0	0	50 FOR.	2100	.115	28.5	5.0	78	.246
TWIN LAKES															
1612B1	7.35	89.6	1.4	8.7	0	0	0	.3	75 FOR.	2100	.115	36.3	5.0	68	.118
1612C1	6.65	85.7	14.3	0	0	0	0	0	75 FOR.	2100	.115	37.3	5.0	68	.106
1612D1	37.94	94.6	4.3	.6	0	0	0	.5	90 FOR.	2100	.115	33.1	5.0	68	.610
ILLINOIS															
CARLYLE RESERVOIR															
1706D1	134.89	14.9	3.0	0	80.5	1.5	0	.1	75 AG.	1010	.049	1.5	6.3	104	.840
1706E1	223.41	29.0	4.5	0	66.2	.2	0	.1	50 AG.	1000	.049	2.3	6.3	102	1.420
1706H1	59.39	9.9	2.5	0	86.8	.8	0	0	75 AG.	1000	.049	1.5	6.3	102	.370
CRAB ORCHARD LAKE															
1712C1	43.90	39.3	7.0	0	52.6	.3	0	.8	50 AG.	1310	.047	8.3	6.0	117	.270
LAKE DECATUR															
1714B1	20.90	.5	2.0	0	97.4	.1	0	0	90 AG.	1000	.056	2.2	6.0	94	.130
1714C1	109.06	3.6	1.2	0	93.8	1.2	0	.2	90 AG.	1010	.049	1.7	6.0	94	.690
1714E1	53.54	0	.9	0	99.1	0	0	0	90 AG.	1000	.038	.5	6.0	94	.340
1714F1	45.56	0	1.1	0	98.9	0	0	0	90 AG.	1010	.045	.6	6.0	94	.280
1714G1	26.37	2.0	2.8	0	93.9	1.2	0	.1	90 AG.	1000	.056	1.5	6.0	94	.160
1714H1	57.06	.6	2.3	0	97.1	0	0	0	90 AG.	1000	.045	1.7	6.0	94	.340
1714J1	21.63	1.4	2.8	0	95.8	0	0	0	90 AG.	1000	.049	1.6	6.0	94	.120
LAKE LOU YAEGER															
1726C1	51.13	1.4	1.1	0	97.3	0	0	.2	90 AG.	1000	.038	.7	6.0	91	.310
REND LAKE															
1735B1	229.14	27.8	3.4	0	68.0	.6	0	.2	50 AG.	1000	.045	3.7	6.3	107	1.460
1735F1	30.82	20.8	3.2	0	76.0	0	0	0	75 AG.	1000	.047	2.6	6.3	107	.190
SHELBYVILLE RESERVOIR															
1739B1	28.21	3.7	.4	0	95.9	0	0	0	90 AG.	1000	.054	1.1	6.0	97	.170
1739C1	40.64	3.0	1.0	0	96.0	0	0	0	90 AG.	1000	.054	.9	6.0	97	.250
1739G1	144.39	1.9	.8	0	97.2	.1	0	0	90 AG.	1000	.054	.7	6.0	97	.930
1739H1	119.30	4.6	1.2	0	93.3	.9	0	0	90 AG.	1000	.054	1.1	6.0	99	.750
SPRINGFIELD LAKE															
1742B1	60.74	1.1	.4	0	98.4	0	0	.1	90 AG.	1000	.054	1.1	6.0	91	.390

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM) TOT P	ANIMAL DENSITY (AN UNITS/SQ KM) TOT N	MEAN CONCENTRATIONS (MG/L) TOT P	MEAN CONCENTRATIONS (MG/L) ORTHO P	MEAN CONCENTRATIONS (MG/L) TOT N	MEAN CONCENTRATIONS (MG/L) INORG N	EXPORT (KG/SQ KM) TOT P	EXPORT (KG/SQ KM) ORTHO P	EXPORT (KG/SQ KM) TOT N	EXPORT (KG/SQ KM) INORG N
IDAHO												
ISLAND PARK RESERVOIR												
1607B1	0	1.523	0	0	.041	.028	.589	.051	17.6	12.0	252.8	21.9
MAGIC RESERVOIR												
1609D1	0	0	3.4	3.8	.092	.065	.830	.144	5.1	3.6	45.7	7.9
PALISADES RESERVOIR												
1610B1	0	0	0	0	.036	.015	.356	.057	12.4	5.2	122.7	19.6
1610C1	0	0	0	0	.019	.009	.234	.084	5.8	2.7	71.3	25.6
1610D1	0	0	0	0	.027	.014	.426	.143	11.1	5.8	175.8	59.0
1610E1	0	0	.1	.1	.037	.012	.494	.140	4.5	1.5	60.1	17.0
LOWER PAYETTE												
1611B1	0	0	0	0	.012	.005	.578	.215	8.7	3.6	419.7	156.1
1611C1	0	0	0	0	.012	.005	.282	.034	8.5	3.5	200.2	24.1
TWIN LAKES												
1612B1	0	.702	0	0	.037	.010	.570	.204	18.7	5.1	288.6	103.3
1612C1	0	1.183	0	0	.023	.015	.642	.039	11.6	7.5	322.7	19.6
1612D1	0	.922	0	0	.030	.015	.558	.057	15.2	7.6	282.9	28.9
ILLINOIS												
CARLYLE RESERVOIR												
1706D1	1	.852	27.7	27.3	.243	.105	2.095	.750	47.7	20.6	411.4	147.3
1706E1	1	0	21.7	21.4	.134	.045	1.720	.529	26.9	9.0	344.8	106.0
1706H1	1	.895	29.1	28.7	.273	.093	2.305	.734	53.6	18.3	452.9	144.2
CRAB ORCHARD LAKE												
1712C1	1	0	28.8	28.4	.089	.021	2.236	1.395	17.3	4.1	433.7	270.6
LAKE DECATUR												
1714B1	1	.828	12.3	12.2	.122	.041	6.399	5.093	23.9	8.0	1255.2	999.0
1714C1	1	.811	11.9	11.7	.153	.078	5.292	4.897	30.5	15.6	1055.9	977.1
1714E1	1	.429	12.5	12.4	.092	.032	6.848	5.832	18.4	6.4	1371.4	1168.0
1714F1	1	.466	15.6	15.4	.078	.026	5.510	4.920	15.1	5.0	1067.9	953.6
1714G1	1	.868	13.4	13.2	.160	.089	5.453	4.809	30.6	17.0	1043.4	920.2
1714H1	1	.563	15.4	15.1	.115	.035	6.227	5.645	21.6	6.6	1170.1	1060.8
1714J1	1	.606	12.1	12.0	.127	.044	6.955	6.051	22.2	7.7	1216.8	1058.7
LAKE LOU YAEGER												
1726C1	1	.735	38.9	38.1	.177	.090	7.265	6.066	33.8	17.2	1389.1	1159.8
REND LAKE												
1735B1	1	0	25.4	24.9	.198	.041	2.390	.710	39.8	8.2	480.2	142.7
1735F1	1	1.283	29.0	28.4	.143	.026	2.138	.685	27.8	5.1	415.7	133.2
SHELBYVILLE RESERVOIR												
1739B1	1	.463	27.2	26.7	.123	.074	5.370	4.694	23.4	14.1	1020.5	892.1
1739C1	1	.562	23.4	22.9	.094	.033	6.660	6.157	18.2	6.4	1292.0	1194.4
1739G1	1	.505	15.8	15.3	.211	.102	7.269	6.359	42.9	20.7	1476.5	1291.6
1739H1	1	.658	18.1	17.6	.270	.136	7.082	5.961	53.5	27.0	1404.1	1181.8
SPRINGFIELD LAKE												
1742B1	1	.732	29.5	28.8	.110	.050	7.332	6.533	22.3	10.1	1484.6	1322.8

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES							OVERALL LAND USE CATEGORY[3]	GEOLOGY		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL[2]	RA	AG	URB	WET	OTHER		ORIGIN	[4] P-COM (%)				
ILLINOIS															
VERMILLION RESERVOIR															
1748A3	98.52	.2	.2	0	97.6	1.7	.1	.2	90 AG.	1214	.050	1.2	6.0	94	.630
1748B1	13.49	3.3	.2	0	96.5	0	0	0	90 AG.	1000	.052	1.6	6.3	97	.090
1748C1	24.29	.2	.2	0	99.6	0	0	0	90 AG.	1000	.050	1.6	6.0	94	.150
1748E1	29.73	.1	.3	0	99.6	0	0	0	90 AG.	1000	.056	1.2	6.0	94	.180
1748F1	43.90	.1	0	0	99.9	0	0	0	90 AG.	1000	.056	1.4	6.3	97	.260
1748G1	35.41	1.4	.7	0	97.2	.7	0	0	90 AG.	1000	.056	1.6	6.0	94	.210
SANGCHRIS LAKE															
1753B1	36.23	2.8	.2	0	97.0	0	0	0	90 AG.	1000	.038	.8	6.0	91	.220
1753C1	12.61	0	0	0	100.0	0	0	0	90 AG.	1000	.038	.2	6.0	91	.080
1753D1	17.38	.1	1.0	0	98.9	0	0	0	90 AG.	1000	.038	.4	6.0	91	.110
1753E1	32.17	1.8	.5	0	97.6	0	0	.1	90 AG.	1000	.038	.5	6.0	91	.200
HOLIDAY LAKE															
1754A2	138.15	3.9	1.4	0	93.9	.8	0	0	90 AG.	1213	.032	1.4	6.0	86	.890
RACOON LAKE															
1762A2	90.86	22.0	2.0	0	75.2	.2	.1	.5	75 AG.	1000	.037	3.0	6.3	104	.570
LAKE VANDALIA															
1764A2	11.47	2.6	0	0	97.4	0	0	0	90 AG.	1000	.038	.9	6.3	97	.070
1764B1	10.54	6.5	0	0	93.5	0	0	0	90 AG.	1000	.038	1.8	6.3	97	.060
1764C1	4.53	5.2	0	0	94.8	0	0	0	90 AG.	1000	.038	1.2	6.3	97	.030
1764D1	3.16	0	0	0	100.0	0	0	0	90 AG.	1000	.044	1.4	6.3	97	.020
INDIANA															
CATARACT LAKE															
1805D1	3.55	54.8	4.1	0	41.1	0	0	0	50 FOR.	1112	.056	10.1	6.0	107	.030
1805E1	6.42	39.0	9.2	0	51.1	0	0	.7	50 AG.	1112	.056	7.1	6.0	107	.060
1805E2	15.67	44.3	6.1	0	47.9	0	1.1	.6	MIXED	1112	.056	16.3	6.0	107	.150
GEIST RESERVOIR															
1811D1	23.88	6.6	1.1	0	91.1	0	0	1.2	90 AG.	1212	.020	3.0	6.3	91	.230
MISSISSINEWA RESERVOIR															
1827C1	7.59	4.9	0	0	93.7	.9	.5	0	90 AG.	1211	.044	1.6	6.3	94	.070
1827D1	25.62	15.5	.3	0	83.6	.2	.4	0	75 AG.	1211	.044	3.4	6.3	94	.240
1827F1	18.36	1.9	0	0	98.1	0	0	0	90 AG.	1211	.044	1.5	6.3	94	.170
MORSE RESERVOIR															
1829B1	48.02	8.5	.1	0	90.4	.9	0	.1	90 AG.	1412	.050	2.1	6.3	91	.530
WAWASEE LAKE															
1836C1	4.53	16.5	1.9	0	80.7	0	.9	0	75 AG.	1400	.080	1.9	6.3	91	.040
WINONA LAKE															
1840B1	29.81	11.9	.4	0	87.1	.2	.2	.2	75 AG.	1212	.020	2.4	6.3	94	.280
1840C1	9.27	8.2	.8	0	89.7	0	.5	.8	75 AG.	1212	.020	2.8	6.3	94	.090
MAXINKUCKEE LAKE															
1843B1	3.81	9.1	6.4	0	84.5	0	0	0	75 AG.	1400	.080	4.7	6.3	94	.040
1843C1	5.10	18.6	6.2	0	72.0	0	3.2	0	50 AG.	1400	.080	5.0	6.3	94	.050

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	TAG 7	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM) TOT P	ANIMAL DENSITY (AN UNITS/SQ KM) TOT N	MEAN CONCENTRATIONS (MG/L) TOT P	MEAN CONCENTRATIONS (MG/L) ORTHO P	MEAN CONCENTRATIONS (MG/L) TOT N	MEAN CONCENTRATIONS (MG/L) INORG N	EXPORT (KG/SQ KM) TOT P	EXPORT (KG/SQ KM) ORTHO P	EXPORT (KG/SQ KM) TOT N	EXPORT (KG/SQ KM) INORG N
ILLINOIS												
VERMILLION RESERVOIR												
1748A3	1	.670	19.9	19.6	.092	.027	7.816	7.011	18.6	5.4	1449.1	1413.8
1748B1	1	1.210	17.4	17.2	.089	.026	8.025	7.444	18.7	5.5	1688.4	1566.2
1748C1	1	1.081	17.9	17.8	.079	.015	7.827	7.247	15.4	2.9	1524.3	1411.3
1748E1	1	.630	17.9	17.8	.153	.019	8.842	7.848	29.2	3.6	1688.2	1498.5
1748F1	1	.720	18.0	17.8	.076	.017	8.394	7.630	14.2	3.2	1567.8	1425.1
1748G1	1	.974	17.5	17.3	.067	.014	7.809	7.177	12.5	2.6	1460.5	1342.3
SANGCHRIS LAKE												
1753B1	1	.678	17.8	17.4	.121	.049	6.624	5.915	23.2	9.4	1268.5	1132.7
1753C1	1	.886	18.3	17.9	.052	.038	6.109	5.229	10.4	7.6	1222.2	1046.2
1753D1	1	.664	18.1	17.7	.121	.046	6.510	5.607	24.2	9.2	1299.4	1119.1
1753E1	1	.741	26.0	25.5	.182	.093	7.641	6.876	35.7	18.2	1498.1	1348.1
HOLIDAY LAKE												
1754A2	1	.664	66.0	67.0	.123	.051	7.141	6.292	25.0	10.4	1450.8	1278.3
RACOON LAKE												
1762A2	1	1.334	26.5	26.1	.191	.045	2.775	.599	37.8	8.9	549.0	118.5
LAKE VANDALIA												
1764A2	1	.378	31.9	31.5	.164	.089	2.260	.888	31.6	17.1	435.0	170.9
1764B1	1	.637	30.6	30.2	.169	.069	2.550	.791	30.3	12.4	457.8	142.0
1764C1	1	.885	31.0	30.6	.191	.069	2.108	.575	39.9	14.4	440.3	120.1
1764D1	1	1.145	32.7	30.3	.313	.133	3.042	1.444	62.5	26.5	607.2	288.2
INDIANA												
CATARACT LAKE												
1805D1	1	0	29.8	29.2	.135	.036	1.222	.675	36.0	9.6	325.7	179.9
1805E1	1	0	37.0	36.3	.259	.142	3.215	1.834	76.3	41.9	947.6	540.5
1805E2	1	0	34.7	34.0	.044	.014	1.155	.532	13.3	4.2	348.7	160.6
GEIST RESERVOIR												
1811D1	1	.500	35.1	34.6	.096	.047	5.143	4.424	29.2	14.3	1562.1	1343.7
MISSISSINEWA RESERVOIR												
1827C1	1	1.390	55.1	53.2	.172	.118	5.226	4.210	50.0	34.3	1520.0	1224.5
1827D1	1	1.060	35.1	33.8	.105	.038	2.616	1.295	31.0	11.2	772.8	382.6
1827F1	1	.590	44.8	43.5	.096	.052	5.781	4.730	28.0	15.2	1688.1	1381.2
MORSE RESERVOIR												
1829B1	1	.700	43.7	42.8	.070	.045	4.029	3.356	24.4	15.7	1402.4	1168.1
WAWASEE LAKE												
1836C1	1	1.590	49.2	48.7	.043	.023	5.048	4.241	12.0	6.4	1405.7	1181.0
WINONA LAKE												
1840B1	1	.770	65.7	62.5	.073	.020	2.781	1.527	21.6	5.9	823.8	452.3
1840C1	1	.820	67.7	64.4	.054	.014	2.928	1.687	16.5	4.3	896.5	516.5
MAXINKUCKEE LAKE												
1843B1	1	1.070	46.1	45.1	.163	.085	4.731	3.373	54.0	28.1	1566.4	1116.8
1843C1	1	0	41.5	40.7	.130	.039	2.630	1.489	40.2	12.1	813.1	460.4

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2] FOR	CL	RA	AG	URB	WET	OTHER	OVERALL[3] LAND USE CATEGORY	GEOLOGY[4] ORIGIN	P-COM (%)	MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
INDIANA															
OLIVER LAKE															
1847B1	5.52	12.1	4.0	0	83.1	0	.8	0	75 AG.	1414	.080	2.4	6.3	89	.050
VERSAILLES LAKE															
1850B1	15.46	25.4	43.4	0	31.2	0	0	0	MIXED	1211	.050	3.9	5.8	104	.140
1850D1	11.58	21.0	10.0	0	68.4	.2	0	.4	50 AG.	1211	.050	3.9	5.8	104	.110
PIGEON LAKE															
185[illegible]A2	33.20	15.0	3.0	0	81.9	0	0	.1	75 AG.	1414	.080	2.4	6.3	89	.310
1855B1	8.18	10.4	5.6	0	84.0	0	0	0	75 AG.	1414	.080	2.1	6.3	89	.080
MARSH LAKE															
1856B1	5.52	15.1	15.7	0	65.7	0	3.5	0	50 AG.	1414	.080	6.0	6.3	89	.050
HAMILTON LAKE															
1857B1	21.89	15.6	.6	0	83.8	0	0	0	75 AG.	1414	.080	3.4	6.3	89	.200
1857C1	2.15	17.0	.1	0	82.9	0	0	0	75 AG.	1414	.080	6.0	6.3	89	.020
1857D1	1.81	25.7	14.9	0	59.4	0	0	0	50 AG.	1414	.080	8.1	6.3	89	.020
IOWA															
AHQUABI LAKE															
1901B1	5.92	25.6	3.9	7.7	57.7	0	0	5.1	50 AG.	1110	.057	9.3	6.0	82	.031
BIG CREEK RESERVOIR															
1902A2	101.81	.7	1.1	.3	97.8	0	.1	0	90 AG.	1110	.057	2.4	6.0	90	.510
1902B1	54.44	.3	1.0	.7	95.3	2.7	0	0	90 AG.	1110	.057	2.3	6.0	90	.261
LAKE MACBRIDE															
19071C	13.96	6.4	.2	0	93.4	0	0	0	90 AG.	1212	.020	9.0	6.3	77	.081
19071D	8.68	3.9	2.0	0	88.3	1.7	0	4.1	75 AG.	1212	.020	10.2	6.0	77	.051
19071E	21.42	4.2	4.3	0	91.1	.2	.1	.1	90 AG.	1212	.020	6.2	6.0	77	.125
19071F	51.37	5.1	2.1	0	92.2	0	.4	.2	90 AG.	1212	.020	7.9	6.0	77	.299
19072E	11.08	.4	3.7	0	95.3	.4	.2	0	90 AG.	1212	.020	5.1	6.0	77	.064
RED ROCK RESERVOIR															
1910E1	65.89	3.7	1.2	0	94.2	0	0	.9	90 AG.	1413	.060	8.9	5.5	71	.395
1910F1	17.60	2.2	0	9.2	88.0	0	0	.6	75 AG.	1413	.060	9.6	6.3	71	.106
1910G1	30.58	1.8	1.0	0	96.6	.4	0	.2	90 AG.	1413	.060	7.2	5.5	71	.183
1910H1	34.31	7.3	.3	0	90.5	.6	0	1.3	90 AG.	1413	.060	8.3	5.5	82	.206
WEST OKOBOJI LAKE															
19151A	27.65	.2	2.2	0	97.2	.2	.2	0	90 AG.	1012	.056	2.2	6.0	72	.107
19151B	20.81	.3	1.6	0	96.7	.8	.3	.3	90 AG.	1012	.056	1.4	6.0	72	.080
19151C	21.22	.5	0	0	99.5	0	0	0	90 AG.	1012	.056	1.9	6.0	72	.082
19151D	30.67	.4	0	0	99.6	0	0	0	90 AG.	1012	.056	1.7	6.0	72	.118
KANSAS															
COUNCIL GROVE RES.															
2002C1	27.50	6.4	0	23.9	67.3	0	1.3	1.1	50 AG.	1015	.050	3.6	6.5	76	.129
2002D1	82.95	5.2	.2	31.8	61.5	0	0	1.3	50 AG.	1015	.050	4.4	6.5	76	.398
2002E1	29.08	6.7	0	48.7	43.4	0	0	1.2	MIXED	1015	.050	7.6	6.5	76	.145
2002F1	45.74	3.1	0	40.1	56.0	0	0	.8	50 AG.	1015	.050	3.9	6.5	76	.220
2002G1	45.31	2.3	0	25.5	71.5	0	0	.7	50 AG.	1015	.050	2.9	6.5	76	.217
2002G2	25.77	.8	0	19.9	78.5	0	0	.8	75 AG.	1015	.050	2.4	6.5	76	.124
2002H1	17.31	1.8	0	14.3	82.9	0	0	1.0	75 AG.	1015	.050	3.8	6.5	76	.081

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
INDIANA												
OLIVER LAKE												
1847B1	1	.800	80.4	77.5	.035	.015	3.285	2.221	10.0	4.3	938.4	634.4
VERSAILLES LAKE												
1850B1	1	0	21.1	20.7	.031	.013	.927	.413	8.9	3.7	264.7	117.9
1850D1	1	0	46.4	45.3	.080	.037	1.336	.603	24.0	11.1	400.2	180.6
PIGEON LAKE												
1855A2	1	.640	47.7	47.9	.078	.020	3.301	1.991	23.0	5.9	972.0	586.3
1855B1	1	1.370	48.9	49.1	.104	.042	5.098	3.597	32.1	13.0	1572.3	1109.4
MARSH LAKE												
1856B1	1	0	38.3	38.4	.161	.105	2.509	1.328	46.0	30.0	716.7	379.3
HAMILTON LAKE												
1857B1	1	1.210	48.8	49.0	.087	.031	3.109	1.820	25.1	8.9	895.8	524.4
1857C1	1	1.370	48.3	48.5	.074	.009	1.700	.736	21.7	2.6	498.7	215.9
1857D1	1	0	34.6	34.7	.052	.013	1.567	.713	18.1	4.5	546.0	248.5
IOWA												
AHQUABI LAKE												
1901B1	1	0	43.9	43.2	.162	.048	4.490	3.048	26.8	7.9	741.5	503.3
BIG CREEK RESERVOIR												
1902A2	1	.860	64.6	63.6	.162	.054	7.890	6.941	25.6	8.5	1246.4	1096.5
1902B1	1	.654	59.7	58.8	.295	.095	8.698	7.356	44.6	14.4	1315.1	1112.2
LAKE MACBRIDE												
19071C	1	1.659	76.6	74.8	.213	.083	4.678	2.894	39.0	15.2	856.0	529.5
19071D	1	1.233	86.2	83.2	.116	.058	3.480	2.373	21.5	10.7	644.8	439.7
19071E	1	1.316	79.1	79.9	.137	.058	7.381	6.381	25.2	10.7	1358.4	1174.3
19071F	1	1.300	91.4	89.5	.248	.107	5.362	3.977	45.5	19.6	984.2	730.0
19072E	1	1.309	76.9	75.2	.161	.091	10.145	8.976	29.3	16.6	1848.0	1635.0
RED ROCK RESERVOIR												
1910E1	1	1.129	86.5	84.9	.300	.066	7.383	5.921	56.7	12.5	1395.8	1119.4
1910F1	1	1.307	83.6	83.1	.173	.064	4.193	3.132	32.9	12.2	796.4	594.9
1910G1	1	1.126	89.1	87.6	.391	.076	6.889	5.322	73.8	14.3	1300.1	1004.4
1910H1	1	1.186	68.8	67.8	.185	.060	3.625	2.428	35.0	11.4	686.4	459.7
WEST OKOBOJI LAKE												
19151A	1	.479	72.5	72.9	.141	.054	9.726	8.374	17.2	6.6	1186.9	1021.9
19151B	1	.482	74.8	75.0	.206	.075	9.829	8.246	25.0	9.1	1191.6	999.7
19151C	1	.847	74.2	74.7	.246	.115	14.460	10.531	30.0	14.0	1762.2	1283.3
19151D	1	.905	74.3	74.7	.071	.043	13.483	12.299	8.6	5.2	1635.9	1492.3
KANSAS												
COUNCIL GROVE RES.												
2002C1	2	0	27.9	27.7	.126	.049	2.479	1.192	18.6	7.2	366.7	176.3
2002D1	2	0	25.2	25.0	.192	.108	2.951	1.860	29.1	16.3	446.5	281.4
2002E1	2	0	18.0	17.9	.062	.027	3.106	1.836	9.7	4.2	488.4	288.7
2002F1	2	0	23.2	23.0	.086	.024	2.520	1.169	13.0	3.6	382.2	177.3
2002G1	2	0	29.6	29.4	.158	.051	2.690	1.194	23.9	7.7	406.3	180.3
2002G2	2	1.420	32.5	32.3	.167	.071	2.788	1.074	25.3	10.8	423.1	163.0
2002H1	2	1.578	34.3	34.1	.059	.027	1.965	.856	8.7	4.0	290.0	127.6

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES							OVERALL LAND USE CATEGORY[3]	GEOLOGY		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL[2]	RA	AG	URB	WET	OTHER		ORIGIN	[4] P-COM (%)				
KANSAS															
MARION RESERVOIR															
2007C1	29.28	1.2	.1	15.6	82.2	0	.1	.8	75 AG.	1200	.020	3.0	6.5	89	.158
2007D1	15.26	1.1	.5	63.0	34.0	0	.2	1.2	50 RAA.	1110	.052	4.4	6.5	89	.082
MILFORD RESERVOIR															
2009D1	53.99	5.3	.3	22.2	70.1	0	0	2.1	50 AG.	1211	.040	4.6	6.5	71	.263
NORTON RESERVOIR															
2010A3	195.48	.6	0	0	98.8	.2	0	.4	90 AG.	1314	.060	2.5	7.2	67	.227
PERRY RESERVOIR															
2011C1	28.97	21.1	1.7	17.1	59.7	0	0	.4	50 AG.	1214	.050	7.4	5.5	97	.088
2011D1	15.56	7.2	.6	4.4	87.3	0	0	.5	75 AG.	1214	.050	5.5	5.5	97	.087
2011E2	35.90	7.4	.3	14.6	77.4	0	0	.3	75 AG.	1214	.050	4.5	5.5	79	.201
2011F1	13.57	34.6	.6	21.7	42.9	0	0	.2	MIXED	1214	.050	8.1	5.5	79	.076
2011G1	17.77	6.6	.6	6.2	86.2	0	0	.4	75 AG.	1214	.050	4.3	5.5	97	.100
POMONA RESERVOIR															
2012D1	30.71	3.6	3.0	23.0	70.0	0	0	.4	50 AG.	1214	.050	3.8	5.5	104	.193
TORONTO RESERVOIR															
2013D1	44.21	11.8	1.9	79.3	6.8	0	.1	.1	75 RA.	1214	.050	7.2	6.5	115	.349
TUTTLE CREEK RESERVOIR															
2014IM	19.18	7.6	7.1	77.4	7.1	0	.5	.3	75 RA.	1214	.050	10.6	6.5	82	.061
2014B1	45.02	7.2	.9	25.6	65.3	0	0	1.0	50 AG.	1214	.050	4.3	6.5	82	.144
2014C1	55.34	3.2	2.0	31.0	63.8	0	0	0	50 AG.	1214	.050	6.4	6.5	82	.188
2014L1	112.92	6.9	2.2	37.9	52.4	.3	0	.3	50 AG.	1214	.050	7.8	6.5	93	.370
2014N1	14.52	4.3	7.2	46.1	42.3	0	0	.1	MIXED	1214	.050	10.5	6.5	82	.046
2014P1	18.47	10.1	2.5	16.8	69.0	0	.3	1.3	50 AG.	1214	.050	5.4	6.5	93	.059
KENTUCKY															
LAKE CUMBERLAND															
2101C1	12.61	46.2	6.2	0	47.6	0	0	0	MIXED	1810	.040	17.8	4.5	132	.170
2101H1	39.63	47.1	1.8	0	50.8	.3	0	0	50 AG.	1810	.040	14.9	4.5	127	.530
2101J1	40.38	35.4	1.8	0	62.5	0	0	.3	50 AG.	1810	.040	13.6	4.5	127	.540
2101K1	58.43	20.3	3.0	0	75.8	.8	0	.1	75 AG.	1810	.040	10.1	4.5	127	.800
2101S1	46.36	89.1	6.6	0	2.8	.5	0	1.0	75 FOR.	1810	.055	22.6	4.5	122	.620
DALE HOLLOW RESERVOIR															
2102B1	12.92	41.0	4.7	0	54.3	0	0	0	50 AG.	1810	.062	16.0	4.5	127	.240
2102C1	30.46	39.9	4.7	0	55.2	.1	0	.1	50 AG.	1812	.020	17.2	4.5	132	.550
2102F1	23.39	78.6	6.0	0	15.4	0	0	0	50 FOR.	1000	.070	25.6	5.0	137	.490
KENTUCKY LAKE															
2104C1	76.59	40.2	4.8	0	55.0	0	0	0	50 AG.	1810	.043	7.6	5.8	122	1.120
2104D1	8.96	52.4	11.4	0	35.6	.3	0	.3	50 FOR.	1810	.043	11.0	4.5	122	.130
2104E1	138.44	54.5	2.5	0	42.7	0	.1	.2	50 FOR.	1800	.070	8.4	4.5	122	2.020
2104F1	32.92	64.3	8.7	0	27.0	0	0	0	50 FOR.	1800	.070	10.9	4.5	122	.470
2104K1	9.61	82.5	2.8	0	14.7	0	0	0	50 FOR.	1000	.070	14.8	4.5	127	.150
2104L1	38.18	76.2	4.0	0	19.6	0	.1	.1	50 FOR.	1000	.070	16.0	4.5	127	.560
2104M1	19.43	66.7	2.5	0	30.5	0	0	.3	50 FOR.	1000	.070	11.8	4.5	127	.280
2104N1	13.99	57.2	10.1	0	29.9	2.1	0	.7	50 FOR.	1000	.070	8.1	4.5	127	.200
2104V1	37.58	74.6	2.2	0	22.9	.3	0	0	50 FOR.	1000	.070	17.5	4.5	132	.550
2104W1	55.04	77.5	3.6	0	18.6	.2	0	.1	50 FOR.	1000	.070	17.8	4.5	132	.800
2104X1	48.02	86.1	2.0	0	11.9	0	0	0	50 FOR.	1000	.070	19.4	4.5	132	.700
2104Y1	59.83	79.1	2.1	0	18.7	.1	0	0	50 FOR.	1000	.070	17.4	4.5	130	.870
2104Z1	19.71	76.1	3.2	0	20.7	0	0	0	50 FOR.	1000	.070	10.3	4.5	127	.290

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
KANSAS												
MARION RESERVOIR												
2007C1	2	1.727	31.9	31.9	.089	.014	1.428	.458	15.1	2.4	243.0	77.9
2007D1	2	0	13.2	13.2	.162	.027	1.829	.373	27.5	4.6	309.9	63.2
MILFORD RESERVOIR												
2009D1	2	0	28.1	27.8	.286	.117	4.421	2.064	43.9	18.0	679.2	317.1
NORTON RESERVOIR												
2010A3	0	.782	18.9	18.9	.246	.181	1.651	.338	9.0	6.6	60.5	12.4
PERRY RESERVOIR												
2011C1	2	0	26.3	24.2	.164	.027	1.918	.741	15.7	2.6	183.7	71.0
2011D1	2	1.602	38.5	35.4	.071	.023	1.577	.839	12.5	4.1	278.1	147.9
2011E2	2	1.375	33.5	31.6	.123	.025	1.696	.807	21.7	4.4	299.5	142.5
2011F1	2	0	18.9	17.4	.066	.025	.817	.236	11.7	4.4	144.3	41.7
2011G1	2	1.133	38.0	34.9	.139	.052	2.279	1.306	24.7	9.2	404.4	231.8
POMONA RESERVOIR												
2012D1	2	0	26.4	26.4	.061	.025	1.802	.542	12.1	5.0	357.1	107.4
TORONTO RESERVOIR												
2013D1	2	0	3.1	3.1	.053	.011	1.092	.261	13.2	2.7	271.9	65.0
TUTTLE CREEK RESERVOIR												
2014IM	2	0	18.3	18.2	.040	.011	.868	.208	4.0	1.1	87.1	20.9
2014B1	2	0	28.1	28.3	.126	.066	2.067	.929	12.7	6.7	208.5	93.7
2014C1	2	0	27.4	27.6	.106	.036	1.644	.578	11.4	3.9	176.1	61.9
2014L1	2	1.577	20.9	20.8	.113	.042	1.991	.708	11.7	4.3	205.7	73.2
2014N1	2	0	24.0	23.8	.075	.055	2.548	1.688	7.5	5.5	254.6	168.6
2014P1	2	0	3.1	3.1	.067	.018	1.883	.726	6.7	1.8	189.7	73.1
KENTUCKY												
LAKE CUMBERLAND												
2101C1	1	0	46.7	46.4	.021	.008	1.554	.811	8.9	3.4	660.7	344.8
2101H1	1	0	47.9	47.7	.025	.014	1.205	.676	10.5	5.9	508.2	285.1
2101J1	1	0	61.6	61.2	.020	.009	1.223	.779	8.4	3.8	515.8	328.5
2101K1	1	1.100	74.7	74.3	.021	.011	1.150	.786	9.1	4.7	496.5	339.4
2101S1	1	1.490	2.3	2.5	.009	.007	.607	.103	3.8	3.0	256.0	43.4
DALE HOLLOW RESERVOIR												
2102B1	1	0	53.2	52.9	.015	.008	.881	.485	8.8	4.7	516.1	284.1
2102C1	1	0	50.6	50.3	.011	.005	1.342	.527	6.3	2.8	764.2	300.1
2102F1	1	0	19.0	20.9	.012	.007	.658	.241	7.9	4.6	434.7	159.2
KENTUCKY LAKE												
2104C1	1	0	30.9	30.6	.129	.037	1.865	.461	59.5	17.1	860.1	212.6
2104D1	1	0	20.0	19.8	.025	.013	1.304	[illegible]	11.4	5.9	596.6	205.0
2104E1	1	0	24.9	24.6	.130	.030	1.630	.483	59.9	13.8	750.0	222.3
2104F1	1	0	16.1	15.9	.042	.009	.544	.124	18.9	4.1	244.9	55.8
2104K1	1	0	9.6	9.4	.008	.006	.598	.096	3.9	3.0	294.4	47.3
2104L1	1	0	12.8	12.6	.009	.006	.818	.337	4.2	2.8	378.4	155.9
2104M1	1	0	19.9	19.6	.010	.006	.565	.224	4.5	2.7	256.8	101.8
2104N1	1	0	19.5	19.2	.020	.007	.800	.218	9.0	3.2	360.7	98.3
2104V1	1	0	19.6	19.5	.019	.008	.580	.193	8.8	3.7	267.7	89.1
2104W1	1	0	12.6	12.4	.018	.009	.551	.177	8.3	4.1	252.6	81.1
2104X1	1	0	7.3	7.2	.012	.007	.869	.195	5.5	3.2	399.5	89.6
2104Y1	1	0	11.5	11.3	.023	.010	1.173	.239	10.5	4.6	537.9	109.6
2104Z1	1	0	13.5	13.3	.008	.006	.271	.142	3.7	2.8	125.7	65.9

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL LAND USE CATEGORY[3]	GEOLOGY[4]		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	P-COM (%)				
LOUISIANA															
ANACOCO LAKE															
2201B1	18.14	84.3	15.0	0	.7	0	0	0	75 FOR.	1814	.063	6.8	4.5	191	.254
2201C1	40.76	67.5	6.8	20.1	5.6	0	0	0	50 FOR.	1418	.060	5.3	4.5	191	.570
2201D1	7.08	87.1	2.3	0	10.6	0	0	0	50 FOR.	1811	.060	7.2	4.5	191	.099
LAKE BISTINEAU															
2203E1	110.18	62.8	2.7	0	28.7	4.0	.2	1.6	50 FOR.	1811	.060	3.2	4.5	183	1.270
2203F1	32.01	62.9	1.4	0	32.9	2.1	0	.7	50 FOR.	1811	.060	2.9	4.5	183	.362
2203G1	45.10	83.1	3.5	0	11.6	.7	0	1.1	50 FOR.	1811	.060	4.1	4.5	183	.490
BLACK BAYOU															
2204E1	16.02	72.0	3.8	0	24.2	0	0	0	50 FOR.	1817	.056	4.6	4.5	198	.182
2204F1	8.22	92.8	1.2	0	6.0	0	0	0	75 FOR.	1817	.056	6.4	4.5	198	.094
BUNDICKS LAKE															
2205C1	44.68	43.1	10.6	0	46.0	0	0	.3	MIXED	1811	.060	3.2	4.5	149	.590
2205D1	11.66	51.7	9.4	0	38.9	0	0	0	50 FOR.	1811	.060	2.6	4.5	149	.154
CADDO LAKE															
2206B1	14.21	77.8	8.9	0	13.3	0	0	0	50 FOR.	1117	.056	3.5	4.5	183	.117
2206C1	112.58	68.7	11.1	15.0	3.2	.8	0	1.2	50 FOR.	1000	.090	4.3	4.5	158	.926
2206G1	50.23	80.0	3.1	3.5	13.2	0	0	.2	50 FOR.	1000	.040	4.5	4.5	158	.414
2206K1	5.27	74.8	1.4	20.6	3.0	0	0	.2	50 FOR.	1000	.090	3.3	4.5	158	.043
CROSS LAKE															
2210C1	207.32	66.2	7.5	0	24.9	.1	0	1.3	50 FOR.	1817	.060	3.0	4.5	154	1.542
2210D1	31.66	76.4	6.7	0	16.5	0	0	.4	50 FOR.	1817	.060	2.0	4.5	154	.234
2210E1	25.61	93.2	2.4	0	3.5	.9	0	0	75 FOR.	1817	.060	2.0	4.5	154	.187
2210H1	5.28	10.6	15.0	0	0	74.4	0	0	URBAN	1815	0	4.9	6.0	154	.039
D'ARBONNE LAKE															
2211B1	71.66	66.6	.7	0	31.5	.5	0	.7	50 FOR.	1817	.056	6.7	4.5	196	.910
2211C1	108.92	72.5	.8	0	25.6	.5	0	.6	50 FOR.	1817	.056	6.6	4.5	196	1.270
2211F1	51.86	64.9	.6	0	33.9	0	0	.6	50 FOR.	1817	.056	6.4	4.5	196	.577
LAKE VERNON															
2217C1	57.59	53.6	30.5	4.9	10.8	0	0	.2	50 FOR.	1411	.060	6.1	4.5	191	.800
2217D1	95.32	59.6	35.4	0	4.7	.2	0	.1	50 FOR.	1411	.060	7.0	4.5	191	1.340
MAINE															
MATTAWAMKEAG LAKE															
2308B1	65.01	82.4	2.2	0	13.8	.1	1.5	0	50 FOR.	1422	.083	5.5	4.5	102	1.100
2308C3	56.88	73.5	2.1	0	21.5	.2	1.8	.9	50 FOR.	3200	.083	5.9	4.5	102	.960
MOORSEHEAD LAKE															
2309K1	18.75	97.3	0	0	0	0	0	2.7	90 FOR.	2214	.083	15.6	4.5	102	.370
RANGELEY LAKE															
2310B1	39.08	99.3	0	0	0	0	0	.7	90 FOR.	2214	.083	12.0	4.5	102	.700
SEBASTICOOK LAKE															
2312F1	53.02	54.6	7.2	0	32.9	0	3.6	1.7	50 FOR.	3200	.083	3.0	4.5	99	1.050
MARYLAND															
DEEP CREEK LAKE															
2402B1	31.93	67.2	3.1	0	18.7	0	9.5	1.5	50 FOR.	1111	.059	5.5	5.5	122	.490
2402C1	7.20	86.0	6.0	0	6.0	0	2.0	0	75 FOR.	1111	.059	16.3	5.0	122	.170
2402D1	9.32	30.3	.7	0	69.0	0	0	0	50 AG.	1011	.065	9.5	5.0	122	.120
2402E1	5.23	45.3	.5	0	54.2	0	0	0	50 AG.	1011	.065	11.2	5.0	122	.150

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM) TOT P	TOT N	MEAN CONCENTRATIONS (MG/L) TOT P	ORTHO P	TOT N	INORG N	EXPORT (KG/SQ KM) TOT P	ORTHO P	TOT N	INORG N
LOUISIANA												
ANACOCO LAKE												
2201B1	2	1.597	.5	.5	.022	.009	.690	.072	9.7	4.0	304.7	31.8
2201C1	2	0	4.4	4.3	.027	.013	.775	.064	11.9	5.7	341.8	28.2
2201D1	2	0	8.3	8.2	.018	.008	.543	.087	7.9	3.5	239.4	38.4
LAKE BISTINEAU												
2203E1	2	0	14.6	14.3	.069	.020	.742	.138	25.1	7.3	269.7	50.2
2203F1	2	0	16.6	16.3	.039	.023	.666	.188	13.9	8.2	237.5	67.0
2203G1	2	0	5.5	5.5	.052	.023	.648	.062	17.8	7.9	222.0	21.2
BLACK BAYOU												
2204E1	2	1.396	12.2	12.2	.040	.018	.904	.201	14.3	6.4	323.9	72.0
2204F1	2	0	3.0	3.0	.037	.017	.693	.072	13.3	6.1	249.9	26.0
BUNDICKS LAKE												
2205C1	2	0	20.2	21.2	.113	.078	.771	.143	47.1	32.5	321.1	59.5
2205D1	2	0	17.1	17.9	.093	.036	1.087	.253	38.7	15.0	452.7	105.4
CADDO LAKE												
2206B1	2	0	6.7	6.7	.086	.026	.943	.081	22.3	6.8	244.9	21.0
2206C1	2	0	1.2	1.2	.091	.044	.731	.075	23.6	11.4	189.6	19.5
2206G1	2	0	5.4	5.5	.046	.017	1.050	.088	12.0	4.4	272.9	22.9
2206K1	2	0	1.2	1.2	.062	.028	.628	.066	16.0	7.2	161.6	17.0
CROSS LAKE												
2210C1	2	0	10.2	10.2	.066	.023	.748	.082	15.5	5.4	175.4	19.2
2210D1	2	0	8.3	8.3	.068	.025	.944	.196	15.8	5.8	220.0	45.7
2210E1	2	1.293	1.8	1.8	.065	.030	.772	.126	15.0	6.9	177.8	29.0
2210H1	2	0	0	0	.333	.138	1.580	.273	77.6	32.1	368.0	63.6
D'ARBONNE LAKE												
2211B1	2	0	21.3	23.2	.099	.027	1.046	.430	39.6	10.8	418.9	172.2
2211C1	2	0	19.9	21.5	.111	.032	1.136	.405	40.8	11.8	417.7	148.9
2211F1	2	0	29.2	31.2	.080	.031	1.011	.374	28.1	10.9	354.7	131.2
LAKE VERNON												
2217C1	2	0	8.1	8.3	.030	.013	.646	.108	13.1	5.7	283.0	47.3
2217D1	2	0	3.7	3.6	.077	.042	.694	.149	34.1	18.6	307.7	66.1
MAINE												
MATTAWAMKEAG LAKE												
2308B1	1	0	1.5	1.5	.010	.005	.803	.267	5.3	2.7	428.5	142.5
2308C3	1	0	21.5	22.9	.012	.005	.624	.173	6.4	2.7	332.1	92.1
MOORSEHEAD LAKE												
2309K1	1	.623	0	0	.008	.006	.325	.112	5.0	3.7	202.3	69.7
RANGELEY LAKE												
2310B1	1	.705	0	0	.010	.005	.590	.172	5.6	2.8	333.3	97.2
SEBASTICOOK LAKE												
2312F1	1	0	36.4	38.8	.017	.006	.966	.227	10.6	3.7	603.3	141.8
MARYLAND												
DEEP CREEK LAKE												
2402B1	1	0	19.0	19.1	.012	.006	.559	.314	5.8	2.9	270.5	152.0
2402C1	1	.770	6.1	6.1	.014	.007	.764	.300	10.4	5.2	568.9	223.4
2402D1	1	0	70.2	70.6	.031	.009	1.414	1.036	12.6	3.7	574.1	420.7
2402E1	1	0	55.2	55.5	.048	.018	1.984	1.588	43.4	16.3	1794.5	1436.3

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL LAND USE CATEGORY[3]	GEOLOGY		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	[4] P-COM (%)				
MARYLAND															
LIBERTY RESERVOIR															
2403B1	18.10	35.1	2.9	0	60.6	1.3	0	.1	50 AG.	3821	.165	10.5	4.5	112	.210
2403C1	73.45	31.3	3.9	0	63.3	1.4	0	.1	50 AG.	3821	.205	13.1	4.5	112	.800
2403D1	16.06	20.8	3.3	0	74.2	1.1	0	.6	50 AG.	3821	.165	7.7	4.5	112	.200
2403E1	37.48	25.3	4.3	0	63.5	6.6	0	.3	50 AG.	3821	.165	9.0	4.5	112	.430
LOCH RAVEN RESERVOIR															
2408B1	53.90	39.9	15.0	0	26.6	17.3	0	1.2	MIXED	3000	.055	7.5	4.5	114	.650
2408C1	150.82	35.2	8.7	0	54.3	1.8	0	0	50 AG.	3000	.055	11.2	4.5	112	1.610
2408D1	10.57	43.2	8.8	0	39.4	8.6	0	0	MIXED	3000	0	11.2	4.5	112	.140
2408E1	8.60	34.1	6.0	0	15.3	44.6	0	0	URBAN	3000	.020	12.8	4.5	112	.050
2408F1	7.95	33.1	7.1	0	37.6	22.2	0	0	MIXED	3000	0	12.2	4.5	112	.130
2408G1	4.14	33.0	9.6	0	53.4	4.0	0	0	50 AG.	3000	.020	11.1	4.5	112	.070
2408H1	2.67	12.5	29.5	0	0	58.0	0	0	URBAN	3000	.020	9.6	4.5	114	.030
2408J1	3.76	5.0	8.1	0	0	86.9	0	0	URBAN	3010	.020	7.1	4.5	114	.030
MICHIGAN															
LAKE CHARLEVOIX															
2617B1	29.09	52.9	6.0	0	40.7	0	.4	0	50 FOR.	1410	.065	11.2	5.0	76	.530
2617D1	44.88	40.6	3.2	0	54.3	.6	.6	.7	50 AG.	1400	.080	8.6	5.0	76	.530
2617E1	202.15	73.4	7.1	0	18.6	.2	.5	.2	50 FOR.	1411	.071	11.2	5.0	76	5.340
MACATAWA LAKE															
2648A3	171.30	4.8	5.9	0	88.0	1.2	0	.1	75 AG.	1311	.053	1.8	5.5	84	1.460
2648B1	39.73	9.5	21.3	0	55.7	7.3	5.8	.4	50 AG.	1300	.040	1.1	5.5	84	.340
PORTAGE LAKE															
2669G1	42.97	58.6	2.4	0	38.9	0	0	.1	50 FOR.	1300	.040	4.7	4.5	91	.590
2669H1	57.55	61.8	6.9	0	27.9	2.6	.1	.7	50 FOR.	1300	.040	5.9	4.5	91	.770
THORNAPPLE LAKE															
2683B1	144.83	19.2	1.0	0	77.2	.3	1.6	.7	75 AG.	1200	.020	1.9	6.3	76	1.180
CRYSTAL LAKE															
2694B1	7.49	26.4	14.1	0	58.5	1.0	0	0	50 AG.	1000	.046	3.1	6.3	76	.060
MINNESOTA															
BIG STONE LAKE															
2709D1	35.02	2.6	2.3	0	95.0	0	0	.1	90 AG.	1415	.060	2.0	7.2	53	.040
2709E1	15.07	3.9	1.6	0	94.5	0	0	0	90 AG.	1415	.060	2.0	7.2	53	.020
2709F1	62.19	1.8	2.0	0	96.2	0	0	0	90 AG.	1415	.060	1.3	7.2	53	.080
BUFFALO LAKE															
2713C1	6.19	9.4	0	0	74.1	15.2	1.3	0	50 AG.	1017	.065	1.5	6.5	74	.040
COKATO LAKE															
2719B2	51.90	4.8	.1	0	75.0	2.3	15.2	2.6	75 AG.	1415	.060	3.1	6.3	69	.210
2719C1	9.82	5.1	0	0	89.8	0	5.1	0	75 AG.	1415	.060	4.0	4.0	69	.040
HERON LAKE															
2739H1	6.24	1.0	1.1	0	97.8	0	0	.1	90 AG.	1415	.060	1.2	6.3	64	.012

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
MARYLAND												
LIBERTY RESERVOIR												
2403B1	1	0	52.3	51.2	.026	.009	2.551	2.235	9.5	3.3	933.4	817.8
2403C1	1	0	54.6	53.5	.017	.007	2.463	2.193	5.8	2.4	846.0	753.3
2403D1	1	0	64.0	62.7	.020	.008	2.765	2.406	7.9	3.1	1085.9	944.9
2403E1	1	0	54.8	53.6	.024	.008	2.908	2.609	8.7	2.9	1052.1	944.0
LOCH RAVEN RESERVOIR												
2408B1	1	0	18.1	17.9	.016	.010	2.115	1.700	6.1	3.8	804.3	646.5
2408C1	1	0	36.8	36.5	.040	.020	2.214	1.927	13.5	6.7	745.3	648.7
2408D1	1	0	26.7	26.5	.018	.013	2.349	1.742	7.5	5.4	981.2	727.6
2408E1	1	0	10.4	10.3	.019	.011	1.424	1.106	3.5	2.0	261.1	202.8
2408F1	1	0	25.5	25.3	.092	.044	3.175	2.630	47.4	22.7	1637.3	1356.2
2408G1	1	0	36.2	35.9	.026	.012	2.385	2.190	33.1	6.4	1271.7	1167.7
2408H1	1	0	0	0	.027	.017	2.342	2.022	9.6	6.0	829.9	716.5
2408J1	1	0	0	0	.020	.015	1.981	1.662	5.0	3.8	498.5	418.2
MICHIGAN												
LAKE CHARLEVOIX												
2617B1	1	0	25.8	25.7	.009	.005	1.947	1.266	5.2	2.9	1118.7	727.4
2617D1	1	0	33.6	33.5	.012	.006	1.436	.372	4.5	2.2	534.8	138.5
2617E1	1	0	8.7	8.5	.014	.006	1.199	.722	11.7	5.0	998.8	601.5
MACATAWA LAKE												
2648A3	1	1.136	66.6	64.3	.167	.057	4.845	2.808	44.9	14.0	1302.3	754.7
2648B1	1	0	45.0	43.3	.076	.029	2.534	1.295	20.5	7.8	683.9	349.5
PORTAGE LAKE												
2669G1	1	0	15.3	15.3	.056	.024	1.437	.282	24.2	10.4	622.2	122.1
2669H1	1	0	11.0	10.9	.041	.024	1.056	.435	17.3	10.1	445.6	183.5
THORNAPPLE LAKE												
2683B1	1	.529	42.7	43.1	.077	.043	1.863	1.017	19.8	11.0	478.7	261.3
CRYSTAL LAKE												
2694B1	1	0	19.8	19.8	.038	.017	1.382	.257	9.6	4.3	349.1	64.9
MINNESOTA												
BIG STONE LAKE												
2709D1	1	.539	29.0	29.0	.089	.031	1.159	.460	3.2	1.1	41.7	16.6
2709E1	1	1.004	28.8	28.0	.052	.030	3.106	2.589	2.2	1.3	130.0	108.4
2709F1	1	.677	29.4	29.3	.073	.035	1.431	.504	3.0	1.4	58.1	20.4
BUFFALO LAKE												
2713C1	1	0	59.3	58.9	.240	.158	2.119	.731	48.9	32.2	431.8	149.0
COKATO LAKE												
2719B2	1	.656	60.0	59.6	.326	.165	3.033	1.275	41.6	21.1	387.0	162.7
2719C1	1	.815	71.8	71.4	.202	.087	4.626	2.312	25.9	11.2	594.2	297.0
HERON LAKE												
2739H1	1	1.010	52.0	51.9	.099	.045	4.676	3.059	6.0	2.7	283.6	185.5

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL LAND USE[3]	GEOLOGY		MEAN SLOPE		AVE ANN PRECIP.	FLOW[6]
		FOR	CL	RA	AG	URB	WET	OTHER	CATEGORY	ORIGIN	P-COM[4] (%)	(%)	PH[5]	(CM)	(CM/SQ KM)
MINNESOTA															
MASHKENODE LAKE															
2756B1	17.28	41.4	14.7	0	1.2	27.8	1.1	13.8	MIXED	3133	.053	4.5	5.5	71	.097
UPPER SAKATAH LAKE															
2777B1	88.34	6.2	1.1	0	79.9	.7	11.5	.6	75 AG.	1200	.040	5.2	6.3	76	.370
LAKE PEPIN															
27A4H1	176.79	19.1	1.2	0	79.6	0	.1	0	75 AG.	1017	.065	9.3	6.3	74	.830
27A4J1	64.39	26.8	4.5	0	68.7	0	0	0	50 AG.	1213	.030	12.0	6.3	74	.320
27A4K1	44.91	19.9	4.2	0	73.8	2.0	0	.1	50 AG.	1213	.030	12.4	6.3	76	.210
ZUMBRO LAKE															
27A5F1	.49	0	0	0	76.2	23.8	0	0	50 AG.	1214	.040	6.7	6.0	74	.002
27A5G1	78.30	7.7	0	0	92.3	0	0	0	90 AG.	1213	.030	5.9	6.0	74	.270
LAKE ST. CROIX															
27A7C1	15.07	13.4	4.8	0	81.5	0	0	.3	75 AG.	1213	.030	6.9	6.5	74	.110
MISSISSIPPI															
ARKABUTLA RESERVOIR															
2801G1	83.14	20.2	5.4	0	70.9	2.9	0	.6	50 AG.	1500	0	5.5	6.0	132	1.380
ENID LAKE															
2802B1	32.14	58.1	1.3	0	40.1	0	0	.5	50 FOR.	1117	.070	9.8	6.0	132	.470
2802D1	34.60	55.3	1.2	0	43.5	0	0	0	50 FOR.	1116	.070	11.8	6.0	132	.530
ROSS BARNETT RESERVOIR															
2804C1	183.79	59.8	.7	0	39.5	0	0	0	50 FOR.	1600	.070	2.3	6.0	127	2.460
SARDIS LAKE															
2805C1	8.91	62.7	10.5	0	26.1	0	0	.7	50 FOR.	1117	.070	6.6	6.0	132	.050
2805E1	69.00	50.7	11.6	0	37.7	0	0	0	50 FOR.	1617	.070	8.4	6.0	132	.970
2805F1	31.31	56.8	6.7	0	35.5	.4	0	.6	50 FOR.	1617	.070	6.8	6.0	132	.380
2805H1	27.38	45.8	5.0	0	48.8	0	0	.4	MIXED	1617	.070	10.4	6.0	132	.400
2805J1	23.98	51.8	1.7	0	45.3	0	0	1.2	50 FOR.	1617	.070	10.4	6.0	132	.180
GRENADA LAKE															
2806F1	56.62	49.0	.9	0	50.0	0	.1	0	50 AG.	1617	.070	3.6	6.0	132	.860
MISSOURI															
CLEARWATER RESERVOIR															
2901D1	11.38	89.0	1.2	3.7	6.1	0	0	0	75 FOR.	1200	.020	24.4	4.5	125	.083
POMME DE TERRE RESERVOIR															
2902C1	63.89	44.4	2.9	0	52.7	0	0	0	50 AG.	1200	.020	5.4	4.5	102	.482
2902E1	74.17	49.2	5.3	1.9	41.4	.1	0	2.1	MIXED	1412	.050	6.8	4.5	102	.450
2902F1	12.23	31.1	3.0	1.4	64.3	0	0	.2	50 AG.	1412	.050	6.2	4.5	102	.559
2902G1	16.47	32.5	1.5	2.5	62.0	0	0	1.5	50 AG.	1200	.020	5.1	4.5	102	.124
2902H1	45.26	26.6	2.8	0	70.0	0	0	.6	50 AG.	1200	.020	4.5	4.5	102	.341
STOCKTON RESERVOIR															
2903B1	82.97	19.7	2.6	5.1	71.4	.5	0	.7	50 AG.	1214	.044	7.0	4.5	102	.630
2903D1	44.63	20.6	3.9	2.5	71.8	.8	0	.4	50 AG.	1000	.048	6.7	4.5	102	.339
2903G1	111.02	20.4	2.8	4.2	71.0	.5	.1	1.0	50 AG.	1200	.020	3.8	4.5	102	.843
2903H1	18.87	47.8	6.6	4.0	41.3	0	0	.3	MIXED	1214	.050	9.2	4.5	102	.143

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
MINNESOTA												
MASHKENODE LAKE												
275681	1	0	.6	.6	.036	.008	1.313	.823	6.4	1.4	232.4	145.7
UPPER SAKATAH LAKE												
2777B1	1	.750	40.3	39.5	.233	.134	5.320	3.080	30.8	17.7	702.7	406.8
LAKE PEPIN												
27A4H1	1	1.226	62.2	61.6	.231	.072	2.586	1.329	34.2	10.7	382.9	196.8
27A4J1	1	0	63.5	63.5	.224	.073	2.059	1.044	35.1	11.4	322.7	163.6
27A4K1	1	0	73.7	73.7	.161	.064	2.391	1.584	23.7	9.4	352.6	233.6
ZUMBRO LAKE												
27A5F1	1	0	66.8	65.9	.121	.062	2.219	1.007	15.6	8.0	285.6	129.6
27A5G1	1	1.450	75.6	74.9	.147	.109	3.651	2.646	16.0	11.9	397.0	287.7
LAKE ST. CROIX												
27A7C1	1	.880	60.5	60.4	.053	.031	1.812	1.341	12.2	7.1	417.1	308.7
MISSISSIPPI												
ARKABUTLA RESERVOIR												
2801G1	1	0	52.0	51.9	.093	.030	.794	.232	48.7	15.7	416.6	121.4
ENID LAKE												
2802B1	1	0	31.1	31.1	.086	.014	1.478	.245	39.7	6.5	681.6	113.0
2802D1	1	0	26.6	26.6	.101	.023	1.235	.270	48.8	11.1	596.6	130.4
ROSS BARNETT RESERVOIR												
2804C1	1	0	64.2	69.5	.219	.088	1.672	.405	92.4	37.1	705.8	171.0
SARDIS LAKE												
2805C1	1	0	15.3	15.3	.031	.010	.850	.344	5.5	1.8	150.4	60.9
2805E1	1	0	25.0	24.9	.034	.013	1.059	.288	15.1	5.8	469.5	127.7
2805F1	1	0	26.2	26.5	.047	.015	1.732	.645	18.0	5.7	662.9	246.9
2805H1	1	0	36.1	36.5	.070	.019	1.288	.419	32.3	8.8	593.4	193.0
2805J1	1	0	33.5	33.8	.064	.017	1.433	.470	15.1	4.0	339.2	111.3
GRENADA LAKE												
2806F1	1	0	38.8	38.7	.086	.016	.801	.144	41.2	7.7	383.7	69.0
MISSOURI												
CLEARWATER RESERVOIR												
2901D1	2	1.878	2.5	2.4	.012	.006	1.096	.081	2.8	1.4	252.1	18.6
POMME DE TERRE RESERVOIR												
2902C1	2	0	27.0	26.5	.017	.009	1.239	.205	4.0	2.1	294.8	48.8
2902E1	2	0	24.1	24.0	.024	.011	1.194	.274	4.6	2.1	228.5	52.4
2902F1	2	0	37.4	37.2	.035	.021	2.174	1.061	50.4	30.3	3133.7	1529.4
2902G1	2	0	34.4	33.8	.018	.010	1.269	.333	4.3	2.4	301.3	79.1
2902H1	2	0	40.7	40.5	.021	.008	1.435	.290	5.0	1.9	341.0	68.9
STOCKTON RESERVOIR												
2903B1	2	0	41.5	41.3	.027	.015	1.527	.564	6.5	3.6	365.6	135.1
2903D1	2	0	42.9	42.7	.019	.013	1.593	.813	4.6	3.1	381.6	194.7
2903G1	2	0	38.3	37.7	.054	.020	1.468	.633	12.9	4.8	351.5	151.6
2903H1	2	0	24.0	23.9	.022	.008	1.183	.345	5.3	1.9	282.7	82.4

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL LAND USE CATEGORY[3]	GEOLOGY[4]		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	P-COM (%)				
MISSOURI															
LAKE TANEYCOMO															
2904B1	93.85	64.5	1.6	0	33.5	.4	0	0	50 FOR.	1200	.020	30.9	4.5	128	.580
2904E1	13.27	72.6	1.3	0	26.1	0	0	0	50 FOR.	1200	.020	14.8	4.5	128	.084
THOMAS HILL RESERVOIR															
2905IE	8.95	60.8	2.1	3.0	33.3	0	0	.8	50 FOR.	1214	.050	14.1	6.3	96	.049
2905IF	11.80	44.8	3.2	10.4	40.6	0	0	1.0	MIXED	1412	.050	14.9	6.3	96	.064
2905A3	61.64	9.0	.5	1.0	89.0	0	0	.5	75 AG.	1214	.050	6.2	5.0	96	.335
2905A4	30.92	6.4	.1	2.5	90.0	0	0	1.0	90 AG.	1200	.020	7.0	5.0	96	.168
2905B2	10.56	8.6	0	0	90.6	0	0	.8	90 AG.	1200	.020	4.2	6.3	96	.057
2905D1	40.46	7.0	.1	0	92.7	0	0	.2	90 AG.	1214	.050	5.4	5.0	96	.220
LAKE WAPPAPELLO															
2906B1	42.25	87.5	1.5	0	11.0	0	0	0	50 FOR.	1312	.030	14.8	6.0	136	.510
2906E1	28.82	86.0	5.3	0	8.4	0	0	.3	50 FOR.	1025	.075	15.4	6.0	133	.348
2906F1	28.73	90.9	6.8	0	2.3	0	0	0	75 FOR.	1025	.075	12.7	6.0	133	.347
MONTANA															
CANYON FERRY															
3001B1	63.40	65.5	34.5	0	0	0	0	0	50 FOR.	1000	.046	46.2	5.5	44	.105
3001C1	98.16	57.4	36.2	4.6	1.8	0	0	0	50 FOR.	1022	.150	47.2	5.5	44	.146
3001D1	53.70	57.6	31.5	7.3	3.6	0	0	0	50 FOR.	1022	.150	41.5	5.5	44	.049
FLATHEAD LAKE															
3003D1	11.77	34.2	1.2	26.5	36.3	0	0	1.8	MIXED	1500	0	19.1	7.5	27	.007
3003E1	15.01	97.4	2.6	0	0	0	0	0	90 FOR.	1700	0	28.2	7.5	27	.009
3003H1	16.66	80.9	18.7	.2	0	0	0	.2	75 FOR.	1100	.040	31.0	5.5	27	.096
3003J1	5.36	92.6	7.1	0	0	0	0	.3	90 FOR.	1134	.060	41.2	5.5	27	.031
GEORGETOWN LAKE															
3004D1	7.76	82.3	17.7	0	0	0	0	0	75 FOR.	1214	.032	19.4	5.5	52	.029
KOOCANUSA RESERVOIR															
3006B1	61.98	90.5	9.5	0	0	0	0	0	90 FOR.	3414	.060	32.2	5.0	48	.444
3006F1	84.83	89.2	10.8	0	0	0	0	0	75 FOR.	1100	.070	32.0	5.0	36	1.260
3006G1	41.71	93.4	6.6	0	0	0	0	0	90 FOR.	3411	.060	25.9	5.0	36	.619
3006H1	37.29	91.4	8.5	0	0	0	.1	0	90 FOR.	3411	.060	33.6	5.0	48	.554
3006J1	39.77	88.5	11.5	0	0	0	0	0	75 FOR.	3411	.060	32.2	5.0	48	.264
3006K1	24.82	88.3	10.8	.9	0	0	0	0	75 FOR.	1100	.080	33.7	5.0	36	.149
3006L1	44.61	96.6	3.4	0	0	0	0	0	90 FOR.	3411	.060	36.9	5.0	36	.268
MARY RONAN LAKE															
3007B1	31.79	98.0	1.9	0	.1	0	0	0	90 FOR.	3411	.060	23.5	7.5	32	.060
3007C1	5.70	98.4	.5	0	1.1	0	0	0	90 FOR.	3411	.060	29.5	7.5	32	.046
MCDONALD LAKE															
3008D1	.95	100.0	0	0	0	0	0	0	90 FOR.	1134	.060	19.7	5.0	74	.010
3008E1	15.96	74.4	4.4	0	0	0	.2	21.0	50 FOR.	1100	.070	42.7	5.0	74	.165
SEELEY LAKE															
3010C1	7.15	72.4	27.5	0	0	0	0	.1	50 FOR.	1034	.040	21.0	5.5	62	.122
3010D1	4.05	62.7	36.7	0	0	0	0	.6	50 FOR.	1034	.040	19.5	5.5	62	.069
3010E1	12.50	65.2	34.2	0	0	0	0	.6	50 FOR.	1034	.040	19.8	5.5	62	.111

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
MISSOURI												
LAKE TANEYCOMO												
2904B1	2	0	15.5	15.2	.010	.005	.683	.183	1.9	1.0	133.1	35.7
2904E1	2	0	8.8	8.8	.011	.005	.923	.091	2.2	1.0	184.3	18.2
THOMAS HILL RESERVOIR												
29051E	2	0	12.9	12.8	.044	.012	1.067	.294	7.6	2.1	184.2	50.8
29051F	2	0	15.8	15.6	.092	.021	1.161	.203	15.7	3.6	198.6	34.7
2905A3	2	1.329	34.6	34.2	.138	.020	2.229	.646	23.7	3.4	382.0	110.7
2905A4	2	1.295	34.9	34.6	.254	.023	2.849	.825	43.5	3.9	488.2	141.4
2905B2	2	.976	35.2	34.8	.175	.027	2.764	.927	29.8	4.6	470.5	157.8
2905D1	2	1.159	36.0	35.6	.150	.022	2.400	.594	25.7	3.8	411.5	101.9
LAKE WAPPAPELLO												
2906B1	2	0	3.3	3.3	.012	.007	1.594	.390	4.6	2.7	606.8	148.5
2906E1	2	1.096	3.4	3.3	.011	.005	.680	.118	4.2	1.9	258.9	44.9
2906F1	2	1.323	.9	.9	.012	.006	.932	.125	4.6	2.3	355.0	47.6
MONTANA												
CANYON FERRY												
3001B1	0	0	0	0	.026	.014	.427	.075	1.4	.7	22.3	3.9
3001C1	90	0	.1	.1	.086	.016	.650	.081	4.0	.8	30.5	3.8
3001D1	90	0	.1	.1	.050	.020	.330	.090	1.4	.6	9.5	2.6
FLATHEAD LAKE												
3003D1	0	0	11.3	11.3	.021	.021	.876	.061	4.0	4.0	16.4	1.1
3003E1	0	1.112	0	0	.018	.010	.689	.078	.3	.2	13.0	1.5
3003H1	0	1.245	.1	.1	.013	.011	.399	.065	2.4	2.0	72.5	11.8
3003J1	0	1.071	0	0	.019	.016	.394	.042	3.5	2.9	71.9	7.7
GEORGETOWN LAKE												
3004D1	90	1.261	0	0	.097	.011	.823	.069	11.4	1.3	97.0	8.1
KOOCANUSA RESERVOIR												
3006B1	0	.964	0	0	.017	.007	.439	.041	3.8	1.6	99.2	9.3
3006F1	0	1.214	0	0	.017	.007	.567	.043	8.0	3.3	265.6	20.1
3006G1	90	1.194	0	0	.031	.016	.734	.040	14.5	7.5	343.5	18.7
3006H1	0	.968	0	0	.018	.010	.336	.026	8.4	4.7	157.4	12.2
3006J1	0	1.281	0	0	.015	.009	.378	.035	3.1	1.9	79.1	7.3
3006K1	90	.896	0	0	.037	.021	.657	.055	7.0	4.0	124.4	10.4
3006L1	0	.812	0	0	.014	.012	.312	.029	2.7	2.3	59.1	5.5
MARY RONAN LAKE												
3007B1	0	1.395	0	0	.042	.015	.377	.031	2.5	.9	22.4	1.8
3007C1	0	1.284	.3	.3	.025	.009	.502	.028	6.4	2.3	127.8	7.1
MCDONALD LAKE												
3008D1	0	2.700	0	0	.015	.006	.722	.136	5.0	2.0	239.7	45.1
3008E1	0	0	0	0	.013	.007	.691	.102	4.2	2.3	225.3	33.3
SEELEY LAKE												
3010C1	0	0	0	0	.013	.006	.528	.048	7.0	3.2	284.1	25.8
3010D1	90	0	0	0	.027	.010	.623	.042	14.5	5.4	334.7	22.6
3010E1	0	0	0	0	.015	.007	.427	.028	4.2	2.0	119.6	7.8

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL LAND USE CATEGORY[3]	GEOLOGY		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	P-COM[4] (%)				
MONTANA															
SWAN LAKE															
3011C1	8.49	85.6	5.8	0	0	0	0	8.6	75 FOR.	1100	.040	38.6	5.5	67	.229
3011D1	19.41	92.1	1.6	0	0	0	0	6.3	90 FOR.	1100	0	48.3	5.5	67	.477
3011E1	7.30	86.9	4.8	0	0	0	0	8.3	75 FOR.	1134	.060	51.2	5.5	67	.197
3011F1	12.00	91.6	4.6	0	0	0	0	3.8	90 FOR.	1134	.060	47.5	5.5	67	.358
TONGUE RIVER RESERVOIR															
3014D1	101.69	1.5	10.1	85.5	2.6	0	0	.3	75 RA.	1112	.066	19.1	7.7	45	.102
3014E1	64.23	7.5	16.6	68.1	7.7	0	0	.1	50 RAF.	1112	.066	22.5	7.7	45	.092
3014F1	56.24	18.0	5.0	71.4	5.6	0	0	0	50 RAF.	1112	.066	21.3	7.3	45	.081
LOWER WHITEFISH															
3016C1	43.07	92.5	5.0	0	.1	0	1.9	.5	90 FOR.	1700	0	6.8	6.5	53	.920
3016E1	7.76	73.5	26.5	0	0	0	0	0	50 FOR.	1700	0	42.5	6.5	53	.178
NEBRASKA															
BRANCHED OAK RES.															
31011C	19.13	3.4	1.1	5.4	89.5	0	0	.6	75 AG.	1300	.040	8.1	6.0	60	.067
3101A2	73.66	4.4	0	23.7	71.4	0	0	.5	50 AG.	1400	.080	13.3	6.0	61	.263
3101A3	13.29	1.7	0	16.6	81.4	0	0	.3	75 AG.	1400	.080	13.3	6.0	61	.047
3101B1	55.98	8.2	0	16.1	74.7	0	0	1.0	50 AG.	1400	.080	9.7	6.0	69	.216
HARRY D. STRUNK RES.															
3103B1	28.38	.4	42.3	57.3	0	0	0	0	50 RAF.	1214	.045	9.7	6.5	60	.041
3103E1	147.48	.9	.2	52.2	46.7	0	0	0	50 RAA.	1214	.045	10.8	6.5	60	.213
3103G1	172.30	.9	0	86.3	12.8	0	0	0	75 RA.	1214	.045	11.8	6.5	51	.250
LAKE MCCONAUGHY															
3106C1	17.18	0	0	66.5	33.5	0	0	0	50 RAA.	1211	.043	9.8	7.2	47	.220
PAWNEE LAKE															
3107A2	37.25	13.4	1.5	0	85.0	0	0	.1	75 AG.	1300	.040	10.1	5.5	69	.100
NEVADA															
LAHONTAN RESERVOIR															
3202C1	115.58	25.8	46.2	28.0	0	0	0	0	MIXED	2422	.098	33.3	7.8	13	.086
LAKE TAHOE															
32051Q	27.61	68.5	31.4	0	0	0	0	.1	50 FOR.	2626	.244	29.1	5.5	65	1.022
32051T	9.80	97.0	2.0	0	0	0	1.0	0	90 FOR.	2223	.100	51.2	5.5	29	.063
32051U	6.90	90.5	9.5	0	0	0	0	0	90 FOR.	1420	.086	49.0	5.5	51	.041
3205H1	24.19	68.8	30.1	0	0	.9	0	.2	50 FOR.	2415	.105	33.7	5.5	81	.882
3205C2	3.99	91.8	8.2	0	0	0	0	0	90 FOR.	2426	.192	24.8	5.5	81	.117
3205N1	19.49	86.8	12.7	0	0	0	.1	.4	75 FOR.	2215	.087	24.3	5.5	81	.748
TOPAZ LAKE															
3206C1	7.05	17.6	0	82.4	0	0	0	0	75 RA.	3124	.096	32.3	7.5	206	.063
3206D1	78.12	45.0	7.4	32.0	15.6	0	0	0	MIXED	2015	.099	30.1	7.5	206	.547
WASHOE LAKE															
32081E	19.98	76.0	23.9	0	0	0	0	.1	75 FOR.	2226	.105	39.6	5.5	96	.142
32081F	10.28	43.7	17.0	39.3	0	0	0	0	MIXED	2224	.088	36.6	5.5	96	.051

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
MONTANA												
SWAN LAKE												
3011C1	0	1.401	0	0	.015	.009	.780	.028	12.8	7.7	663.5	23.8
3011D1	0	1.198	0	0	.012	.008	.582	.093	9.3	6.2	451.0	72.1
3011E1	0	1.261	0	0	.010	.005	1.135	.217	8.5	4.3	965.9	184.7
3011F1	0	1.243	0	0	.012	.008	.648	.093	11.3	7.5	609.7	87.5
TONGUE RIVER RESERVOIR												
3014D1	0	0	.3	.3	.063	.010	1.399	.191	2.0	.3	44.3	6.0
3014E1	0	0	.9	.9	.127	.014	1.719	.356	5.7	.6	77.6	16.1
3014F1	0	0	.6	.6	.099	.023	1.430	.200	4.5	1.0	65.0	9.1
LOWER WHITEFISH												
3016C1	0	.922	0	0	.017	.008	.716	.092	11.5	5.4	482.3	62.0
3016E1	0	0	0	0	.014	.009	.558	.068	10.1	6.5	403.6	49.2
NEBRASKA												
BRANCHED OAK RES.												
31011C	2	1.779	29.2	28.9	.385	.282	2.837	1.989	42.5	31.1	313.3	219.7
3101A2	2	0	30.2	30.2	.260	.158	1.735	.837	29.3	17.8	195.4	94.2
3101A3	2	1.473	31.6	31.6	.206	.147	2.069	1.014	23.0	16.4	230.7	113.1
3101H1	2	0	35.7	35.7	.218	.143	2.073	1.157	26.5	17.4	252.2	140.8
HARRY D. STRUNK RES.												
3103B1	0	0	10.5	10.4	.106	.053	3.207	2.126	4.8	2.4	146.1	96.9
3103E1	0	0	11.5	11.5	.132	.029	2.367	1.320	6.0	1.3	107.8	60.1
3103G1	0	0	3.1	3.1	.137	.089	2.738	1.905	6.3	4.1	125.3	87.2
LAKE MCCONAUGHY												
3106C1	0	0	6.8	6.9	.127	.100	1.945	1.467	51.3	40.4	785.5	592.4
PAWNEE LAKE												
3107A2	2	1.496	42.6	42.6	.325	.234	1.790	.921	27.5	19.8	151.5	78.0
NEVADA												
LAHONTAN RESERVOIR												
3202C1	90	0	0	0	.438	.395	2.500	.902	10.3	9.3	58.7	21.2
LAKE TAHOE												
32051Q	0	0	0	0	.038	.019	.479	.058	44.4	22.2	559.1	67.7
32051T	0	1.263	0	0	.027	.012	.344	.053	5.5	2.4	69.7	10.7
32051U	0	.870	0	0	.053	.033	.492	.034	9.9	6.2	92.2	6.4
3205B1	0	0	0	0	.016	.013	.354	.036	18.4	14.9	407.0	41.4
3205C2	0	1.003	0	0	.010	.006	.394	.022	9.2	5.5	364.3	20.3
3205N1	0	.892	0	0	.017	.010	.453	.035	20.6	12.1	548.3	42.4
TOPAZ LAKE												
3206C1	0	0	0	0	.115	.024	.900	.101	32.4	6.8	253.6	28.5
3206D1	0	0	37.6	37.6	.123	.092	.715	.093	27.2	20.3	157.9	20.5
WASHOE LAKE												
32081E	0	1.197	0	0	.029	.017	.376	.036	6.5	3.8	84.3	8.1
32081F	0	0	0	0	.023	.012	.497	.031	3.6	1.9	77.8	4.9

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL[3] LAND USE CATEGORY	GEOLOGY		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	[4] P-COM (%)				
NEW HAMPSHIRE															
LAKE WINNIPESAUKEE															
330341	17.09	87.3	2.3	0	7.5	.1	2.5	.3	50 FOR.	2332	.101	8.4	4.5	109	.320
3303D1	.73	74.2	3.2	0	16.1	6.5	0	0	50 FOR.	2300	.144	15.1	4.5	114	.020
3303E1	6.14	77.1	4.9	0	7.8	.8	7.4	2.0	50 FOR.	2322	.123	11.7	4.5	114	.120
3303F1	3.06	80.0	5.0	0	15.0	0	0	0	50 FOR.	2322	.123	11.4	4.5	114	.060
3303J1	7.02	82.8	4.4	0	12.4	.4	0	0	50 FOR.	2300	.144	12.4	4.5	114	.140
3303K1	18.36	93.5	1.0	0	4.8	0	0	.7	75 FOR.	2326	.161	18.1	4.5	114	.350
3303L1	40.51	91.5	1.6	0	2.5	1.6	2.1	.7	75 FOR.	2326	.137	12.6	4.5	112	.780
3303N1	8.65	79.4	7.2	0	8.3	1.8	3.3	0	50 FOR.	2332	.088	5.7	4.5	109	.170
3303U1	23.00	95.0	.2	0	.9	.1	2.5	1.3	90 FOR.	2322	.113	14.9	4.5	107	.440
3303V1	8.96	94.9	1.1	0	2.3	0	0	1.7	75 FOR.	2332	.098	12.7	4.5	107	.170
3303X1	7.56	96.3	.7	0	3.0	0	0	0	75 FOR.	3223	.122	16.5	4.5	109	.160
3303Y1	9.84	91.3	2.9	0	5.8	0	0	0	75 FOR.	2323	.129	17.4	4.5	107	.190
NEW JERSEY															
SPRUCE RUN RESERVOIR															
3420A2	40.32	48.2	8.9	0	40.4	2.2	0	.3	MIXED	3012	.064	5.6	4.5	122	.570
3420B1	30.35	46.2	6.0	0	46.5	.5	0	.8	MIXED	3012	.064	11.2	4.5	122	.420
3420C1	7.38	46.7	5.1	0	48.2	0	0	0	MIXED	3012	.064	12.9	4.5	122	.110
3420D1	6.37	57.9	10.6	0	30.3	1.2	0	0	50 FOR.	3012	.064	14.8	4.5	122	.090
3420E1	4.61	69.2	2.7	0	28.1	0	0	0	50 FOR.	3012	.064	15.4	4.5	122	.070
UNION LAKE															
3422B1	38.95	49.5	1.5	0	45.1	3.4	.1	.4	MIXED	1300	.040	1.5	4.5	122	.480
NEW MEXICO															
EAGLE NEST LAKE															
3504C1	27.16	79.6	5.7	11.5	3.2	0	0	0	75 FOR.	1000	.050	33.1	5.5	39	.074
ELEPHANT BUTTE RES.															
3505E1	41.36	0	100.0	0	0	0	0	0	75 CL.	1126	.101	14.7	7.7	24	.005
UTE RESERVOIR															
3509C1	44.52	.5	0	97.7	0	0	0	1.8	75 RA.	1314	.060	4.3	6.8	33	.029
NEW YORK															
CANADIAGUA LAKE															
3604A3	14.56	22.0	3.3	0	73.4	0	1.3	0	50 AG.	1415	.075	3.6	6.3	84	.090
3604C1	12.07	56.4	13.7	0	29.9	0	0	0	50 FOR.	1111	.075	12.8	6.3	84	.080
3604D1	3.34	40.0	28.5	0	31.5	0	0	0	MIXED	1114	.078	15.3	6.3	84	.020
3604E1	16.24	50.0	19.8	0	29.0	1.2	0	0	50 FOR.	1110	.060	13.4	6.3	84	.100
3604H1	114.48	68.9	9.6	0	18.2	1.2	1.8	.3	50 FOR.	1111	.080	17.1	5.0	81	1.390
CANNONSVILLE RES.															
3605B1	11.29	88.6	5.3	0	6.1	0	0	0	75 FOR.	1314	.060	20.7	5.5	109	.180
3605D1	32.01	77.6	3.1	0	18.8	.5	0	0	50 FOR.	1314	.060	14.9	5.5	109	.520
3605E1	51.52	66.2	15.5	0	17.8	.3	.2	0	50 FOR.	1314	.060	16.0	5.5	109	.940
3605F1	3.11	100.0	0	0	0	0	0	0	90 FOR.	1314	.060	26.0	5.5	109	.060

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
NEW HAMPSHIRE												
LAKE WINNIPESAUKEE												
330341	1	0	6.7	6.4	.017	.008	.517	.106	10.0	4.7	305.3	62.6
3303D1	1	0	13.4	12.9	.017	.010	.348	.074	14.7	8.6	300.7	63.9
3303E1	1	0	6.5	6.2	.030	.010	.622	.129	18.5	6.2	383.4	79.5
3303F1	1	0	12.5	12.0	.018	.008	.358	.164	11.1	4.9	221.4	101.4
3303J1	1	0	11.0	10.6	.013	.007	.807	.599	8.2	4.4	507.5	376.7
3303K1	1	.516	4.3	4.1	.015	.006	.589	.329	9.0	3.6	354.1	197.8
3303L1	1	1.011	2.2	2.1	.018	.010	.676	.172	10.9	6.1	410.5	104.4
3303N1	1	0	7.4	7.1	.018	.007	.504	.091	11.2	4.3	312.4	56.4
3303U1	1	1.060	.8	.7	.017	.006	.544	.082	10.3	3.6	328.2	49.5
3303V1	1	.951	1.9	1.8	.020	.007	.855	.127	12.0	4.2	511.6	76.0
3303X1	1	.595	2.5	2.4	.017	.006	.343	.075	11.3	4.0	228.9	50.1
3303Y1	1	.487	4.8	4.6	.020	.006	.304	.109	12.2	3.7	185.1	66.4
NEW JERSEY												
SPRUCE RUN RESERVOIR												
3420A2	1	0	32.9	31.2	.035	.021	1.582	.939	15.6	9.4	705.3	418.6
3420B1	1	0	37.9	35.9	.023	.014	1.541	1.101	10.0	6.1	672.5	480.5
3420C1	1	0	39.3	37.2	.022	.009	1.638	.839	10.3	4.2	769.9	394.4
3420D1	1	0	24.7	23.4	.024	.012	1.098	.506	10.7	5.3	489.2	225.5
3420E1	1	0	22.9	21.7	.032	.018	1.350	.550	15.3	8.6	646.5	263.4
UNION LAKE												
3422B1	1	0	17.8	15.4	.026	.012	1.909	1.249	10.1	4.7	741.9	485.4
NEW MEXICO												
EAGLE NEST LAKE												
3504C1	0	1.559	.2	.2	.077	.023	1.219	.129	6.6	2.0	104.7	11.1
ELEPHANT BUTTE RES.												
3505E1	0	0	0	0	.013	.011	.744	.025	0	0	2.8	.1
UTE RESERVOIR												
3509C1	0	0	0	0	.082	.018	1.550	.235	1.7	.4	31.8	4.8
NEW YORK												
CANADIAGUA LAKE												
3604A3	1	0	34.2	34.3	.050	.015	2.826	2.036	9.7	2.9	550.9	396.9
3604C1	1	0	12.2	12.2	.064	.044	1.392	.949	13.4	9.2	291.0	198.4
3604D1	1	0	14.7	14.7	.022	.010	.890	.528	4.2	1.9	168.1	99.7
3604E1	1	0	13.6	13.6	.017	.007	.896	.572	3.3	1.4	174.0	111.1
3604H1	1	0	8.5	8.5	.030	.007	.941	.662	11.5	2.7	360.3	253.5
CANNONSVILLE RES.												
3605B1	1	.750	6.2	6.2	.016	.009	.492	.181	8.0	4.5	247.4	91.0
3605D1	1	0	19.2	19.2	.021	.010	.899	.515	10.8	5.1	460.6	263.8
3605E1	1	0	18.2	18.2	.018	.009	1.216	.759	10.4	5.2	699.7	436.7
3605F1	1	.860	0	0	.014	.007	.803	.378	8.5	4.3	488.6	230.0

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES							OVERALL LAND USE CATEGORY[3]	GEOLOGY		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL[2]	RA	AG	URB	WET	OTHER		ORIGIN[4]	P-COM (%)				
NEW YORK															
CARRY FALLS RESERVOIR															
3606B1	4.92	95.1	0	0	0	0	2.9	2.0	90 FOR.	1550	0	4.5	4.5	97	.090
CASSADAGA LAKE															
3607B1	.75	62.8	3.9	0	33.3	0	0	0	50 FOR.	1400	.080	10.8	5.0	97	.020
3607C1	1.27	76.4	18.6	0	5.0	0	0	0	75 FOR.	1400	.080	14.6	6.0	97	.020
CAYUGA LAKE															
3608G2	6.81	20.6	27.8	0	51.6	0	0	0	50 AG.	1400	.080	4.0	6.3	86	.080
3608H1	22.02	27.9	23.1	0	45.8	.5	2.7	0	MIXED	1400	.080	3.1	6.3	86	.300
3608M1	6.16	21.1	6.3	0	72.1	0	.5	0	50 AG.	1010	.050	2.9	6.3	86	.030
3608P2	6.29	11.9	7.0	0	80.6	.5	0	0	75 AG.	1410	.065	5.5	6.3	89	.070
3608Q1	37.30	22.9	4.0	0	71.0	.3	1.8	0	50 AG.	1010	.050	3.2	6.3	89	.450
CHAUTAUQUA LAKE															
3610B1	27.97	47.7	6.4	0	38.2	1.2	6.4	.1	MIXED	1400	.080	6.6	6.0	107	.510
3610C1	60.66	66.8	14.7	0	14.6	.2	3.4	.3	50 FOR.	1400	.080	8.9	5.0	107	1.130
3610D1	24.94	45.9	4.4	0	45.8	.2	3.5	.2	MIXED	1400	.080	7.9	5.0	107	.220
3610E1	75.73	56.8	6.6	0	31.6	2.7	2.1	.2	50 FOR.	1400	.080	6.9	5.0	107	1.510
3610F1	4.12	35.9	10.0	0	6.3	47.8	0	0	URBAN	1400	.080	5.8	5.0	107	.030
3610H1	15.44	53.5	11.6	0	34.4	.5	0	0	50 FOR.	1411	.072	8.3	5.0	107	.310
3610J1	31.73	62.9	13.5	0	19.9	.8	2.7	.2	50 FOR.	1400	.080	8.3	5.0	107	.590
3610K1	35.77	57.4	5.0	0	35.8	.3	1.5	0	50 FOR.	1400	.080	7.4	5.0	107	.590
GOODYEAR LAKE															
3613B1	29.50	51.9	1.6	0	40.4	1.1	5.0	0	50 FOR.	1111	.064	11.4	5.0	102	.470
3613C1	5.67	41.3	1.5	0	56.4	0	.8	0	50 AG.	1111	.064	8.9	5.0	102	.090
3613D1	10.23	74.4	5.9	0	17.6	0	2.1	0	50 FOR.	1111	.064	11.4	5.0	102	.170
3613E1	32.58	58.3	5.0	0	32.4	1.1	3.1	.1	50 FOR.	1100	.064	11.3	5.0	102	.520
LAKE HUNTINGTON															
3615A1	.44	77.4	6.4	0	0	12.9	3.3	0	50 FOR.	1314	.060	6.4	5.5	114	.010
KEUKA LAKE															
3617B1	3.37	39.9	13.6	0	38.1	8.4	0	0	MIXED	1400	.080	10.5	5.0	86	.030
3617C1	5.96	28.7	8.3	0	62.4	0	.6	0	50 AG.	1400	.080	6.7	5.0	86	.050
3617D1	89.72	41.2	20.4	0	35.3	.2	2.1	.8	MIXED	1412	.074	9.0	6.3	86	.750
3617F1	8.21	27.3	22.6	0	48.4	.8	.9	0	MIXED	1412	.050	4.7	6.3	86	.070
3617H1	4.12	26.0	26.1	0	47.8	0	.1	0	MIXED	1414	.080	7.5	5.0	86	.040
OTTER LAKE															
3625B1	1.06	18.9	13.5	0	62.2	0	5.4	0	50 AG.	1412	.050	7.9	5.0	91	.010
ROUND LAKE															
3630A1	7.54	87.8	3.8	0	1.8	5.9	.7	0	50 FOR.	1400	.080	7.6	5.0	104	.120
3630B1	2.28	44.5	3.7	0	51.8	0	0	0	50 AG.	1400	.080	4.7	5.0	104	.040
3630C1	44.60	34.5	25.3	0	26.9	5.8	5.0	2.5	MIXED	1400	.080	4.6	5.0	104	.730
SCHROON LAKE															
3634D1	25.07	89.1	1.6	0	0	4.6	2.4	2.3	50 FOR.	2223	.133	12.9	4.5	97	.410
3634D2	21.57	93.7	0	0	0	.7	2.8	2.8	90 FOR.	2223	.133	13.9	4.5	97	.350
3634E1	5.70	94.0	2.4	0	0	.8	0	2.8	90 FOR.	2223	.133	12.2	4.5	97	.090
3634F1	5.98	92.3	0	0	0	2.8	3.7	1.2	50 FOR.	3100	.101	17.6	4.5	99	.100
3634G1	61.77	88.8	1.1	0	0	.2	6.6	3.3	75 FOR.	2130	.120	11.4	4.5	99	1.040

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
NEW YORK												
CARRY FALLS RESERVOIR												
3606B1	1	1.440	0	0	.018	.006	1.171	.260	10.4	3.5	675.5	150.0
CASSADAGA LAKE												
3607B1	1	0	3.3	3.3	.029	.007	.856	.457	24.4	5.9	719.9	384.3
3607C1	1	.810	15.9	15.9	.010	.005	.799	.458	5.0	2.5	396.8	227.5
CAYUGA LAKE												
3608G2	1	0	25.0	31.8	.021	.008	1.428	1.017	7.8	3.0	529.0	376.8
3608H1	1	0	16.4	16.4	.022	.006	1.039	.635	9.5	2.6	446.4	272.8
3608M1	1	0	55.9	55.2	.027	.012	2.579	1.765	4.1	1.8	396.1	271.1
3608P2	1	1.190	48.1	47.5	.051	.028	1.745	1.101	20.5	11.2	699.9	441.6
3608Q1	1	0	42.4	41.8	.031	.010	1.943	1.512	11.8	3.8	739.2	575.3
CHAUTAUQUA LAKE												
3610B1	1	0	32.8	32.7	.032	.013	1.006	.390	18.4	7.5	578.5	224.3
3610C1	1	0	12.5	12.5	.034	.012	.853	.460	20.0	7.0	501.1	270.2
3610D1	1	0	39.3	39.2	.027	.008	.816	.384	7.5	2.2	227.0	106.8
3610E1	1	0	27.1	27.0	.031	.010	.807	.330	19.5	6.3	507.4	207.5
3610F1	1	0	5.4	5.4	.094	.032	1.340	.399	21.6	7.3	307.7	91.6
3610H1	1	0	29.5	29.4	.031	.009	.878	.365	19.6	5.7	555.9	231.1
3610J1	1	0	17.1	17.0	.011	.006	.706	.366	6.5	3.5	414.0	214.6
3610K1	1	0	30.7	30.6	.023	.006	1.180	.751	12.0	3.1	613.8	390.6
GOODYEAR LAKE												
3613B1	1	0	37.5	37.2	.025	.008	1.191	.715	12.6	4.0	598.4	359.2
3613C1	1	0	52.3	51.9	.026	.008	.982	.427	13.0	4.0	491.6	213.7
3613D1	1	0	16.3	16.2	.018	.006	.960	.482	9.4	3.1	503.1	252.6
3613E1	1	0	30.0	29.8	.035	.009	1.058	.542	17.6	4.5	532.5	272.8
LAKE HUNTINGTON												
3615A1	1	0	0	0	.038	.022	1.178	.416	27.2	15.8	844.3	298.2
KEUKA LAKE												
3617B1	1	0	21.2	21.4	.045	.029	1.108	.905	12.6	8.1	311.1	254.1
3617C1	1	0	31.1	31.3	.017	.008	1.551	.851	4.5	2.1	410.3	225.1
3617D1	1	0	14.4	14.4	.033	.008	1.058	.715	8.7	2.1	278.9	188.5
3617F1	1	0	19.8	19.8	.027	.014	1.939	1.345	7.3	3.8	521.4	361.6
3617H1	1	0	26.6	26.9	.034	.018	2.044	1.338	10.4	5.5	625.8	409.7
OTTER LAKE												
3625B1	1	0	37.1	36.6	.023	.009	2.302	1.724	6.8	2.7	684.9	512.9
ROUND LAKE												
3630A1	1	0	1.2	1.2	.061	.010	.963	.275	30.6	5.0	483.3	138.0
3630B1	1	0	35.8	35.6	.097	.023	1.111	.237	53.7	12.7	614.7	131.1
3630C1	1	0	18.6	18.5	.050	.018	.912	.266	25.8	9.3	470.7	137.3
SCHROON LAKE												
3634D1	1	0	0	0	.019	.006	.890	.222	9.8	3.1	459.0	114.5
3634D2	1	.545	0	0	.015	.006	1.110	.157	7.7	3.1	568.0	80.3
3634E1	1	.664	0	0	.012	.006	.864	.251	6.0	3.0	430.2	125.0
3634F1	1	.410	0	0	.010	.005	.832	.159	5.3	2.6	438.8	83.8
3634G1	1	.497	0	0	.013	.005	1.293	.143	6.9	2.7	686.5	75.9

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2] FOR	CL	WA	AG	URB	WET	OTHER	OVERALL LAND USE CATEGORY[3]	GEOLOGY[4] ORIGIN	P-COM (%)	MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
NEW YORK															
SENECA LAKE															
3635D1	37.87	43.0	22.1	0	32.9	.6	.9	.5	MIXED	1410	.072	16.4	5.0	81	.590
3635F2	64.59	42.5	34.2	0	21.6	.1	1.5	.1	MIXED	1410	.072	9.1	6.3	84	.950
3635G1	13.52	55.7	24.5	0	19.0	.4	0	.4	50 FOR.	1014	.065	6.3	6.3	81	.060
3635H1	14.27	40.6	32.6	0	22.5	2.5	1.2	.6	MIXED	1014	.065	4.4	6.3	84	.230
3635L1	24.50	20.3	50.8	0	24.7	4.2	0	0	50 CL.	1014	.065	2.4	6.3	81	.120
3635M1	33.05	58.8	13.0	0	22.0	1.7	4.0	.5	50 FOR.	1014	.065	12.2	6.3	81	.490
SWAN LAKE															
3636A1	17.02	60.5	8.7	0	21.6	4.9	4.0	.3	50 FOR.	1111	.060	12.6	5.5	114	.360
SWINGING BRIDGE RES.															
3637H1	27.35	51.0	25.1	0	7.4	15.6	.5	.4	50 FOR.	1413	.060	12.2	5.5	114	.420
CONESUS LAKE															
3639A1	4.84	25.0	9.6	0	65.4	0	0	0	50 AG.	1400	.080	4.3	6.3	79	.060
3639B1	6.76	25.2	25.2	0	47.5	2.1	0	0	MIXED	1114	.080	6.2	6.3	79	.080
3639C1	6.11	23.8	6.5	0	69.7	0	0	0	50 AG.	1410	.065	6.0	6.3	79	.080
3639D2	.78	6.7	3.3	0	43.3	46.7	0	0	URBAN	1410	.065	5.0	6.3	79	.010
3639F1	7.61	15.4	9.5	0	71.4	.3	3.4	0	50 AG.	1412	.050	3.1	6.3	79	.080
3639H1	18.08	39.6	10.4	0	48.4	1.1	.4	.1	MIXED	1114	.080	9.3	6.3	79	.220
LOWER ST. REGIS															
3640A1	1.71	92.7	0	0	0	1.8	5.5	0	75 FOR.	3300	.134	5.8	4.5	97	.030
ALLEGHENY RES.															
3541C1	73.53	50.0	1.8	0	47.4	.3	.5	0	50 FOR.	1000	.060	10.6	5.0	112	1.310
3641H1	10.93	93.0	2.7	0	4.3	0	0	0	75 FOR.	1410	.060	17.4	5.0	114	.290
3641J1	53.51	96.0	1.2	0	2.3	.5	0	0	75 FOR.	1310	.040	18.8	5.0	114	1.570
3641K1	30.23	99.1	.9	0	0	0	0	0	90 FOR.	1310	.040	18.5	5.0	114	.450
3641L1	51.67	98.3	1.7	0	0	0	0	0	90 FOR.	1314	.060	16.8	5.0	117	.650
3641M1	55.40	95.1	4.6	0	0	.3	0	0	90 FOR.	1314	.060	14.1	5.0	117	.590
3641N1	177.19	91.9	5.4	0	1.6	1.0	0	.1	75 FOR.	1314	.060	12.8	5.0	117	2.000
NORTH CAROLINA															
BADIN LAKE															
3701B1	23.05	77.3	.8	0	21.2	0	0	.7	50 FOR.	2526	.149	8.8	4.5	114	.240
BLEWETT FALLS LAKE															
3702B1	36.67	80.5	1.0	0	18.2	0	0	.3	50 FOR.	1000	.090	6.8	4.5	112	.310
3702C1	32.56	72.4	8.3	0	19.2	0	0	.1	50 FOR.	1024	.093	5.4	4.5	117	.290
3702G1	16.24	54.9	1.6	0	43.1	0	0	.4	50 FOR.	1024	.076	3.6	4.5	112	.140
3702H1	77.52	76.1	.6	0	21.7	.5	0	1.1	50 FOR.	1022	.081	8.1	4.5	122	1.180
FONTANA LAKE															
3704C1	81.61	87.0	0	0	13.0	0	0	0	50 FOR.	1036	.068	43.8	4.5	142	3.040
3704E1	29.03	98.3	0	0	1.3	0	0	.4	90 FOR.	1130	.057	46.5	4.5	142	.650
3704F1	24.04	88.2	.3	0	11.5	0	0	C	50 FOR.	1140	.060	38.0	4.5	142	.910
HIGH ROCK LAKE															
3706B1	39.03	65.3	.8	0	32.4	1.1	0	.4	50 FOR.	2526	.126	6.4	4.5	114	.320
3706D1	33.64	41.6	2.6	0	54.7	.6	0	.5	50 AG.	2223	.134	7.9	4.5	114	.280
3706G1	40.12	42.7	1.9	0	52.6	1.6	0	1.2	50 AG.	2223	.134	5.7	4.5	114	.400

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
NEW YORK												
SENECA LAKE												
3635D1	1	0	19.5	19.8	.021	.009	1.106	.593	10.3	4.4	543.4	291.4
3635F2	1	0	8.8	8.8	.024	.011	.937	.468	11.1	5.1	434.6	217.1
3635G1	1	0	11.3	11.4	.010	.007	1.582	.923	1.4	1.0	221.4	129.2
3635H1	1	0	9.2	9.2	.017	.009	1.575	1.069	8.6	4.6	800.6	543.4
3635L1	1	0	8.9	8.8	.025	.011	1.007	.579	3.9	1.7	155.5	89.4
3635M1	1	0	13.1	13.2	.021	.008	.837	.347	9.8	3.7	391.3	162.2
SWAN LAKE												
3636A1	1	0	54.0	46.6	.041	.015	1.183	.389	27.3	10.0	789.1	259.5
SWINGING BRIDGE RES.												
3637H1	1	0	18.5	16.0	.033	.014	1.044	.452	16.0	6.8	505.6	218.9
CONESUS LAKE												
3639A1	1	0	34.5	35.0	.069	.039	2.349	1.487	27.0	15.2	918.3	581.3
3639B1	1	0	25.0	25.4	.050	.027	1.554	.751	18.7	10.1	580.0	280.3
3639C1	1	0	36.7	37.3	.043	.018	1.827	.956	17.8	7.4	754.4	394.7
3639D2	1	0	22.8	23.1	.078	.057	1.588	1.077	31.5	23.0	642.0	435.4
3639F1	1	0	37.6	38.2	.098	.058	2.448	1.205	32.5	19.2	811.6	399.5
3639H1	1	0	25.5	25.9	.022	.008	1.153	.382	8.4	3.1	442.4	146.6
LOWER ST. REGIS												
3640A1	1	.605	0	0	.013	.007	.798	.315	7.2	3.9	441.5	174.3
ALLEGHENY RES.												
3641C1	1	0	45.8	45.8	.033	.011	.531	.280	18.5	6.2	298.3	157.3
3641H1	1	.720	7.1	7.1	.012	.006	1.303	.628	10.0	5.0	1090.3	525.5
3641J1	1	1.290	1.7	1.7	.015	.006	.783	.336	13.9	5.6	724.5	310.9
3641K1	1	1.070	0	0	.010	.006	1.198	.437	4.7	2.8	562.4	205.1
3641L1	1	1.080	0	0	.011	.006	1.153	.564	4.4	2.4	457.4	223.7
3641M1	1	.930	0	0	.010	.005	1.115	.554	3.4	1.7	374.5	186.1
3641N1	1	1.102	1.2	1.2	.014	.005	1.164	.341	5.0	1.8	414.3	121.4
NORTH CAROLINA												
BADIN LAKE												
3701B1	1	0	19.4	20.1	.034	.008	.830	.188	11.2	2.6	272.5	61.7
BLEWETT FALLS LAKE												
3702B1	1	0	20.1	17.6	.025	.013	.575	.108	6.7	3.5	153.3	28.8
3702C1	1	0	21.2	18.6	.032	.012	.803	.093	9.0	3.4	225.5	26.1
3702G1	1	0	68.8	82.2	.045	.016	1.048	.230	12.2	4.3	284.9	62.5
3702H1	1	0	32.4	35.7	.025	.008	.716	.138	12.0	3.8	343.7	66.2
FONTANA LAKE												
3704C1	1	0	13.1	12.9	.027	.006	.612	.202	31.7	7.0	718.9	237.3
3704E1	1	2.270	1.0	1.0	.015	.007	.293	.120	10.6	4.9	206.9	84.7
3704F1	1	0	8.6	8.6	.034	.011	.893	.283	40.6	13.1	1066.0	337.8
HIGH ROCK LAKE												
3706B1	1	0	24.6	24.4	.027	.013	.817	.204	7.0	3.4	211.2	52.7
3706D1	1	0	41.6	41.2	.040	.017	.844	.408	10.5	4.5	221.5	107.1
3706G1	1	0	39.8	39.7	.038	.023	.566	.158	11.9	7.2	178.0	49.7

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS [1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES [2] FOR	CL	RA	AG	URB	WET	OTHER	OVERALL LAND USE CATEGORY [3]	GEOLOGY ORIGIN	[4] P-COM (%)	MEAN SLOPE (%)	[5] PH	AVE ANN PRECIP. (CM)	FLOW [6] (CM/SQ KM)
NORTH CAROLINA															
HIWASSEE LAKE															
3707B1	65.50	78.8	1.4	0	19.8	0	0	0	50 FOR.	1331	.060	35.9	4.5	152	1.620
3707C1	14.01	88.7	.9	0	10.3	0	0	.1	50 FOR.	1331	.060	21.3	4.5	152	.340
LOOKOUT SHOALS LAKE															
3710B1	13.39	40.7	.5	0	58.7	0	0	.1	50 AG.	3800	.244	8.9	4.5	119	.230
RHODHISS LAKE															
3715G1	15.80	63.8	0	0	35.4	.8	0	0	50 FOR.	3200	.040	12.0	4.5	127	.280
3715H1	19.79	73.8	1.8	0	22.7	1.7	0	0	50 FOR.	3222	.081	10.9	4.5	127	.410
SANTEETLAH LAKE															
3716A2	144.88	83.4	.5	0	15.0	1.0	0	.1	50 FOR.	1031	.068	39.1	4.5	157	4.140
3716B1	9.71	73.0	.8	0	26.0	0	0	.2	50 FOR.	1031	.068	40.7	4.5	142	.310
3716C1	19.22	85.3	1.9	0	12.7	0	0	.1	50 FOR.	1031	.068	39.8	4.5	142	.630
3716D1	110.62	97.3	.6	0	2.1	0	0	0	75 FOR.	1031	.068	39.2	4.5	147	4.500
3716E1	35.66	97.3	.5	0	2.2	0	0	0	75 FOR.	1031	.068	42.6	4.5	152	1.150
3716F1	72.88	99.5	.2	0	.3	0	0	0	90 FOR.	1031	.068	39.9	4.5	165	1.920
LAKE TILLERY															
3717C1	29.50	55.1	.2	0	43.5	.8	0	.4	50 FOR.	3324	.107	9.4	4.5	114	.320
NORTH DAKOTA															
ASHTABULA LAKE															
3801B1	6.97	1.2	4.0	0	94.8	0	0	0	90 AG.	1413	.060	1.9	7.7	55	.006
JAMESTOWN RESERVOIR															
3806B1	20.52	0	3.0	0	96.8	0	.2	0	90 AG.	1413	.060	3.0	7.7	51	.025
MATEJCEK RESERVOIR															
38081C	26.06	1.4	6.3	3.0	87.5	0	1.5	.3	75 AG.	1413	.060	3.9	7.7	40	.012
SAKAKAWEA RESERVOIR															
38121P	41.56	0	3.1	15.9	80.9	0	0	.1	75 AG.	1500	0	6.8	6.5	50	.041
3812D1	300.28	4.1	59.6	6.5	29.2	0	.1	.5	50 CL.	1500	0	12.5	7.7	48	.360
3812M1	38.70	0	40.2	19.4	40.4	0	0	0	MIXED	1500	0	7.6	6.5	50	.031
3812N1	22.83	.5	41.9	19.2	37.9	0	0	.5	MIXED	1500	0	8.8	6.5	50	.018
3812R1	136.84	1.4	32.4	45.1	14.7	0	0	6.4	MIXED	1500	0	11.6	7.7	50	.073
3812R2	57.93	.1	21.5	69.3	4.9	0	.2	4.0	50 RAF.	1500	0	8.9	7.7	50	.030
3812S1	103.33	6.7	51.0	9.7	31.7	.2	0	.7	50 CL.	1500	0	12.5	7.7	48	.043
SWEET BRIAR LAKE															
38141D	36.33	0	.5	13.0	85.9	0	.3	.3	75 AG.	1500	0	3.4	8.5	52	.031
3814B1	18.66	.1	.8	24.2	74.3	0	.3	.3	50 AG.	1500	0	4.9	8.5	52	.016
3814C1	18.16	0	0	33.8	66.2	0	0	0	50 AG.	1500	0	2.6	8.5	52	.015
OHIO															
BEACH CITY RESERVOIR															
3901C1	44.21	13.3	.7	0	84.0	1.9	0	.1	75 AG.	1000	.048	5.2	5.5	102	.430
3901D1	83.99	15.4	2.7	0	80.2	.4	0	1.3	75 AG.	1000	.048	6.6	5.5	102	.810
3901E1	8.96	30.3	2.8	0	63.8	0	0	3.1	50 AG.	1000	.048	11.4	5.5	102	.090
3901F1	34.50	29.0	1.9	0	65.9	.3	0	2.9	50 AG.	1000	.048	14.3	5.5	102	.350
3901G1	15.51	16.1	3.6	0	76.3	1.0	0	3.0	75 AG.	1000	.048	12.3	5.5	102	.160
3901H1	31.03	17.0	1.5	0	79.5	1.4	0	.6	75 AG.	1000	.048	11.4	5.5	102	.300
3901K1	70.42	21.6	4.3	0	65.6	.3	0	8.2	50 AG.	1010	.051	16.1	5.5	102	.710

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM) TOT P	ANIMAL DENSITY (AN UNITS/SQ KM) TOT N	MEAN CONCENTRATIONS (MG/L) TOT P	MEAN CONCENTRATIONS (MG/L) ORTHO P	MEAN CONCENTRATIONS (MG/L) TOT N	MEAN CONCENTRATIONS (MG/L) INORG N	EXPORT (KG/SQ KM) TOT P	EXPORT (KG/SQ KM) ORTHO P	EXPORT (KG/SQ KM) TOT N	EXPORT (KG/SQ KM) INORG N
NORTH CAROLINA												
HIWASSEE LAKE												
3707B1	1	0	30.7	28.1	.014	.005	.316	.070	10.9	3.9	246.5	54.6
3707C1	1	0	16.0	14.6	.048	.006	.510	.179	36.7	4.6	390.3	137.0
LOOKOUT SHOALS LAKE												
3710B1	1	0	52.4	51.4	.033	.014	.824	.376	17.9	7.6	446.4	203.7
RHODHISS LAKE												
3715G1	1	0	54.8	59.4	.054	.016	1.294	.295	30.2	8.9	723.2	164.9
3715H1	1	0	35.2	38.1	.022	.012	.659	.230	14.4	7.8	430.6	150.3
SANTEETLAH LAKE												
3716A2	1	0	11.2	11.2	.029	.006	.490	.186	26.1	5.4	441.6	167.6
3716B1	1	0	19.4	19.4	.037	.008	.663	.187	37.3	8.1	667.5	188.3
3716C1	1	0	9.5	9.5	.024	.008	.452	.154	24.8	8.3	467.2	159.2
3716D1	1	2.140	1.6	1.6	.011	.007	.384	.083	14.1	9.0	492.6	106.5
3716E1	1	1.830	1.6	1.6	.010	.005	.469	.111	10.2	5.1	477.0	112.9
3716F1	1	1.800	.2	.2	.006	.005	.619	.177	5.0	4.2	514.3	147.1
LAKE TILLERY												
3717C1	1	0	45.8	44.5	.050	.026	1.190	.487	17.1	8.9	407.1	166.6
NORTH DAKOTA												
ASHTABULA LAKE												
3801B1	92	.577	11.4	11.4	.357	.254	2.110	.449	9.7	7.5	57.3	12.2
JAMESTOWN RESERVOIR												
3806B1	2	.775	14.7	15.0	.231	.107	2.455	.300	8.9	4.1	94.3	11.5
MATEJCEK RESERVOIR												
38081C	2	1.024	6.5	6.4	.260	.185	2.852	1.021	3.8	2.7	41.4	14.8
SAKAKAWEA RESERVOIR												
38121P	0	1.386	15.7	15.7	.285	.113	2.972	.954	8.9	3.5	92.5	29.7
3812D1	0	0	3.3	3.5	.226	.043	1.621	.294	8.5	1.6	61.3	11.1
3812M1	0	0	6.8	6.8	.084	.026	1.117	.196	2.1	.7	28.2	5.0
3812N1	0	0	6.4	6.4	.122	.032	1.235	.157	3.0	.8	30.7	3.9
3812R1	0	0	2.2	2.2	.147	.026	1.354	.184	2.5	.4	22.8	3.1
3812R2	0	0	.7	.7	.101	.017	1.040	.089	1.6	.3	17.0	1.5
3812S1	0	0	3.6	3.8	.118	.032	1.473	.202	1.5	.4	19.3	2.7
SWEET BRIAR LAKE												
38141D	90	1.316	31.7	31.8	.250	.102	2.227	.610	6.7	2.7	59.9	16.4
3814B1	90	0	27.4	27.5	.457	.187	4.470	1.425	12.4	5.1	120.9	38.5
3814C1	90	0	20.8	20.8	.315	.097	2.817	.394	8.2	2.5	73.4	10.3
OHIO												
BEACH CITY RESERVOIR												
3901C1	1	1.350	79.1	77.6	.165	.068	2.771	2.130	50.6	20.9	849.9	653.3
3901D1	1	.340	86.9	85.3	.121	.019	2.751	1.949	36.8	5.8	836.7	592.8
3901E1	1	0	50.5	50.5	.032	.006	2.011	1.465	10.1	1.9	637.0	464.1
3901F1	1	0	76.1	74.7	.100	.022	2.671	1.833	32.0	7.0	854.5	586.4
3901G1	1	1.000	88.1	86.5	.145	.050	3.714	2.596	47.2	16.3	1208.2	844.5
3901H1	1	1.330	91.7	90.1	.121	.034	3.225	2.213	36.9	10.4	1074.7	674.7
3901K1	1	0	55.6	55.7	.197	.007	3.304	2.492	62.6	2.2	1050.5	792.3

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES							OVERALL LAND USE CATEGORY[3]	GEOLOGY		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL[2]	RA	AG	URB	WET	OTHER		ORIGIN	[4] P-COM (%)				
OHIO															
CHARLES MILL RESERVOIR															
3905B1	19.76	18.4	0	0	79.8	1.3	0	.5	75 AG.	1000	.056	5.3	6.0	89	.190
3905C1	42.17	16.6	.9	0	81.3	.7	.2	.3	75 AG.	1000	.048	2.9	6.0	89	.410
DEER CREEK RESERVOIR															
3906B1	31.57	3.0	.8	0	96.0	0	0	.2	90 AG.	1400	.080	1.3	6.3	99	.330
3906C1	15.41	2.3	.6	0	97.1	0	0	0	90 AG.	1014	.062	.1	6.3	99	.150
DILLON RESERVOIR															
3908B1	11.86	35.9	13.3	0	50.8	0	0	0	50 AG.	1000	.048	15.6	5.5	102	.130
3908C1	9.14	46.6	14.1	0	39.3	0	0	0	MIXED	1010	.051	15.7	5.5	99	.090
3908E1	12.71	38.3	8.4	0	52.4	.9	0	0	50 AG.	1014	.042	11.5	6.3	99	.140
3908F1	50.30	33.0	9.5	0	57.3	0	0	.2	50 AG.	1014	.042	15.0	6.3	102	.520
3908G1	40.46	50.9	10.5	0	38.5	0	0	.1	50 FOR.	1010	.051	14.7	5.5	102	.430
LAKE GRANT															
3912A1	52.89	15.9	1.9	0	82.0	0	0	.2	75 AG.	1412	.050	.8	6.0	109	.580
3912B1	5.00	11.2	.8	0	86.6	1.2	0	.2	75 AG.	1412	.050	1.4	6.0	107	.060
HOOVER RESERVOIR															
3914C1	32.30	11.3	.9	0	87.0	.4	0	.4	75 AG.	1014	.066	.7	6.3	97	.320
MOSQUITO CREEK RESERVOIR															
3921A1	47.63	30.9	5.4	0	62.8	0	.2	.7	50 AG.	1014	.066	1.5	6.3	99	.480
3921B1	9.17	25.9	5.8	0	67.4	0	.5	.4	50 AG.	1000	.056	2.2	6.3	99	.100
PLEASANT HILL LAKE															
3924B1	28.36	29.0	6.0	0	64.3	.7	0	0	50 AG.	1012	.042	9.3	6.0	91	.290
3924C1	31.03	35.4	12.6	0	51.3	.7	0	0	50 AG.	1012	.042	15.3	6.0	91	.320
3924D1	16.08	29.8	8.9	0	60.1	1.2	0	0	50 AG.	1012	.042	11.6	5.5	91	.170
3924E1	21.52	28.0	5.6	0	66.2	.2	0	0	50 AG.	1012	.042	12.5	5.5	91	.230
GRAND LAKE OF ST. MARYS															
3927B1	18.60	6.0	.9	0	93.0	0	0	.1	90 AG.	1214	.044	1.0	6.3	94	.170
3927C1	45.84	5.5	.4	0	92.3	1.8	0	0	90 AG.	1214	.044	1.6	6.3	94	.440
3927D1	47.22	6.7	.4	0	92.4	.2	0	.3	90 AG.	1214	.044	1.8	6.3	94	.450
3927F1	8.62	15.2	0	0	84.8	0	0	0	75 AG.	1214	.044	2.5	6.3	94	.090
3927G1	12.10	4.4	0	0	95.0	.6	0	0	90 AG.	1214	.044	1.2	6.3	94	.120
ATWOOD RESERVOIR															
3928B1	12.20	38.7	20.6	0	40.2	0	0	.5	MIXED	1010	.053	18.0	5.5	91	.160
3928C1	20.98	38.5	8.2	0	52.7	.3	0	.3	50 AG.	1010	.053	13.0	5.5	91	.210
BERLIN RESERVOIR															
3929B1	47.14	25.8	4.4	0	67.5	0	.7	1.6	50 AG.	1000	.052	4.6	6.0	91	.470
3929F1	18.93	39.1	4.2	0	52.1	.4	.1	4.1	50 AG.	1000	.052	1.7	6.0	91	.190
HOLIDAY LAKE															
3930C1	6.55	11.7	0	0	87.5	.4	0	.4	75 AG.	1012	.042	4.0	6.3	89	.060
O'SHAUGHNESSY RESERVOIR															
3931C1	27.40	10.0	0	0	89.2	.3	0	.5	75 AG.	1214	.044	1.3	6.3	94	.270
ROCKY FORK CREEK															
3932B1	86.14	19.2	5.4	0	73.6	1.8	0	0	50 AG.	1214	.044	8.3	6.0	112	1.000
3932C1	15.15	11.8	1.7	0	86.0	.5	0	0	75 AG.	1214	.044	4.0	6.0	107	.170

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM) TOT P	ANIMAL DENSITY (AN UNITS/SQ KM) TOT N	MEAN CONCENTRATIONS (MG/L) TOT P	MEAN CONCENTRATIONS (MG/L) ORTHO P	MEAN CONCENTRATIONS (MG/L) TOT N	MEAN CONCENTRATIONS (MG/L) INORG N	EXPORT (KG/SQ KM) TOT P	EXPORT (KG/SQ KM) ORTHO P	EXPORT (KG/SQ KM) TOT N	EXPORT (KG/SQ KM) INORG N
OHIO												
CHARLES MILL RESERVOIR												
3905B1	1	1.530	58.2	59.1	.029	.014	1.574	.850	8.8	4.2	477.3	257.7
3905C1	1	1.400	38.5	39.3	.035	.021	1.747	1.000	10.7	6.4	535.6	306.6
DEER CREEK RESERVOIR												
3906B1	1	.910	34.1	50.8	.065	.022	3.532	2.684	21.4	7.3	1164.3	884.8
3906C1	1	.550	51.8	51.2	.088	.040	3.328	2.585	27.0	12.3	1021.6	793.5
DILLON RESERVOIR												
3908B1	1	0	41.1	43.0	.028	.011	1.336	.462	9.7	3.8	461.8	159.7
3908C1	1	0	31.8	33.2	.023	.008	1.220	.412	7.1	2.5	378.8	127.9
3908E1	1	0	31.5	32.5	.046	.016	1.525	.868	16.0	5.6	529.7	301.5
3908F1	1	0	34.4	35.6	.041	.012	1.687	.972	13.4	3.9	550.0	316.9
3908G1	1	0	25.8	26.8	.018	.007	.794	.337	6.0	2.3	266.1	112.9
LAKE GRANT												
3912A1	1	1.610	41.4	41.2	.213	.059	1.858	.452	73.7	20.4	642.5	156.3
3912B1	1	1.650	43.7	43.5	.215	.046	1.632	.319	81.4	17.4	617.6	120.7
HOOVER RESERVOIR												
3914C1	1	.860	42.6	44.3	.081	.032	2.338	1.377	25.3	10.0	730.5	430.2
MOSQUITO CREEK RESERVOIR												
3921A1	1	0	41.1	41.1	.069	.014	1.632	.583	21.9	4.4	518.7	185.3
3921B1	1	0	43.9	43.9	.087	.025	2.088	.975	29.9	8.6	718.1	335.3
PLEASANT HILL LAKE												
3924B1	1	0	30.4	31.1	.049	.022	2.118	1.449	15.8	7.1	683.0	467.3
3924C1	1	0	24.3	24.8	.025	.010	1.340	.945	8.1	3.3	435.8	307.3
3924D1	1	0	28.4	29.1	.039	.013	1.849	1.240	13.0	4.3	616.5	413.4
3924E1	1	0	31.3	32.0	.036	.013	2.023	1.510	12.1	4.4	681.8	508.9
GRAND LAKE OF ST. MARYS												
3927B1	1	1.080	62.4	57.6	.216	.097	4.476	3.196	62.3	28.0	1290.1	921.2
3927C1	1	1.190	69.6	62.6	.318	.148	3.896	2.466	96.3	44.8	1179.3	746.5
3927D1	1	1.400	69.7	62.7	.278	.127	3.915	2.617	83.5	38.2	1176.6	786.5
3927F1	1	1.060	49.8	47.5	.226	.074	4.504	2.965	74.4	24.4	1483.0	976.3
3927G1	1	.700	71.6	64.5	.435	.358	4.954	4.038	136.0	112.0	1549.4	1262.9
ATWOOD RESERVOIR												
3928B1	1	0	26.6	26.9	.028	.010	.916	.537	9.3	3.3	304.1	178.3
3928C1	1	0	34.9	35.2	.038	.012	1.870	1.117	12.0	3.8	590.3	352.6
BERLIN RESERVOIR												
3929B1	1	0	49.4	47.7	.057	.019	2.608	1.312	17.9	6.0	820.0	412.5
3929F1	1	0	36.8	35.4	.044	.008	1.518	.593	13.9	2.5	480.5	187.7
HOLIDAY LAKE												
3930C1	1	2.340	22.1	23.1	.104	.029	4.377	3.027	30.0	8.4	1264.4	874.4
O'SHAUGHNESSY RESERVOIR												
3931C1	1	.850	37.9	38.9	.063	.028	2.331	1.513	19.6	8.7	724.4	470.2
ROCKY FORK CREEK												
3932B1	1	0	49.3	48.8	.039	.023	2.080	.756	14.3	8.4	761.5	276.8
3932C1	1	2.460	57.6	57.0	.099	.029	2.500	1.388	35.0	10.3	884.7	491.2

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS 1 STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES 2 FOR	CL	RA	AG	URB	WET	OTHER	OVERALL 3 LAND USE CATEGORY	GEOLOGY ORIGIN	4 P-COM (%)	MEAN SLOPE (%)	5 PH	AVE ANN PRECIP. (CM)	FLOW 6 (CM/SQ KM)
OHIO															
LAKE SHAWNEE															
3933A2	21.24	2.4	.3	0	94.6	2.6	0	.1	90 AG.	1214	.044	1.4	6.3	94	.220
TAPPAN RESERVOIR															
3934A1	53.82	35.5	8.9	0	30.7	.2	0	24.7	MIXED	1000	.056	24.3	5.5	99	.590
3934B1	23.13	30.9	9.2	0	30.4	.7	0	28.8	MIXED	1011	.060	19.5	5.5	99	.250
3934D1	8.96	47.3	5.4	0	47.3	0	0	0	MIXED	1000	.056	22.8	5.5	99	.100
OKLAHOMA															
ALTUS RESERVOIR															
4001B1	107.03	3.6	3.0	7.2	84.5	1.0	.2	.5	75 AG.	1300	.040	1.8	7.2	79	.110
4001C1	39.63	0	1.8	1.5	95.6	.2	0	.9	90 AG.	1123	.145	1.1	7.2	79	.036
ARBUCKLE LAKE															
4002B1	88.59	16.9	4.3	0	75.1	0	0	3.7	75 AG.	1100	.060	6.0	6.5	96	.360
LAKE ELLSWORTH															
4003B1	26.86	9.1	0	70.5	19.0	0	0	1.4	MIXED	1500	0	6.7	7.2	86	.150
4003C1	40.98	7.2	.3	43.6	47.1	0	0	1.8	MIXED	1500	0	6.3	7.2	86	.233
LAKE EUFAULA															
4004B1	81.83	46.3	1.1	28.3	23.5	.7	0	.1	MIXED	1315	.040	6.3	5.5	122	.900
FORT COBB RESERVOIR															
4005A2	343.27	3.6	2.4	26.0	66.4	.2	0	1.4	50 AG.	1312	.030	3.8	6.5	94	.570
4005B1	136.42	5.7	2.0	13.0	78.4	0	0	.9	75 AG.	1312	.030	5.4	6.5	94	.208
4005C1	42.71	7.1	0	0	92.9	0	0	0	90 AG.	1300	.040	4.7	6.5	94	.071
FORT SUPPLY RESERVOIR															
4006C1	53.05	.6	0	27.5	71.6	0	0	.3	50 AG.	1300	.040	4.5	6.5	38	.035
4006D1	23.59	.2	0	24.2	75.4	0	0	.2	75 AG.	1300	.040	4.8	6.5	38	.015
4006E1	33.80	.2	.2	56.5	42.7	0	0	.4	50 RAA.	1300	.040	7.1	6.5	38	.021
4006G1	233.89	.6	0	49.2	50.0	0	0	.2	50 AG.	1300	.040	6.5	6.5	41	.154
FOSS DAM RESERVOIR															
4007B1	62.54	6.5	0	60.0	31.5	0	0	2.0	50 RAA.	1200	.020	6.4	7.2	68	.059
4007D1	46.88	4.2	.3	35.2	56.3	0	0	4.0	50 AG.	1213	.030	7.3	7.2	68	.044
GRAND LK O' THE CHEROKEE															
40091L	49.88	69.7	8.6	0	21.6	0	0	.1	50 FOR.	1000	.042	21.3	4.5	136	.442
40091M	145.28	61.5	6.7	10.1	21.7	0	0	0	50 FOR.	1000	.042	18.2	4.5	116	1.287
40092M	92.04	56.9	6.0	13.1	24.0	0	0	0	50 FOR.	1000	.042	16.0	4.5	136	.815
KEYSTONE RESERVOIR															
4011B1	28.35	16.6	.9	53.2	29.3	0	0	0	50 RAA.	1000	.042	4.9	5.5	117	.085
4011E1	120.82	13.9	1.5	13.5	70.8	.3	0	0	50 AG.	1000	.042	4.9	5.5	117	.450
4011E2	15.07	4.8	0	27.7	67.5	0	0	0	50 AG.	1000	.042	4.4	5.5	117	.068
4011F1	76.85	18.7	2.1	35.0	43.9	0	0	.3	MIXED	1010	.042	4.2	5.5	116	.323
4011G1	142.06	13.2	2.6	39.7	44.3	.1	0	.1	MIXED	1010	.042	4.1	5.5	116	.568
4011G2	41.67	7.2	6.0	40.9	45.2	.2	0	.5	MIXED	1010	.042	4.4	5.5	116	.175
OOLOGAH LAKE															
4012D1	20.91	4.8	0	32.2	62.5	0	0	.5	50 AG.	1200	.020	4.4	5.5	106	.138
4012D2	49.70	5.0	.4	55.3	38.5	0	0	.8	50 RAA.	1214	.050	4.8	5.5	106	.328
4012E1	93.22	14.1	3.6	30.8	51.3	0	0	.2	50 AG.	1412	.050	5.0	5.5	106	.615
4012F1	41.81	15.9	13.9	31.3	38.7	0	0	.2	MIXED	1214	.039	5.7	5.5	106	.276

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
OHIO												
LAKE SHAWNEE												
3933A2	1	.870	71.7	71.3	.044	.016	4.292	3.540	14.4	5.2	1402.0	1156.3
TAPPAN RESERVOIR												
3934A1	1	0	23.0	24.9	.034	.008	1.134	.540	11.8	2.8	392.0	186.7
3934B1	1	0	22.8	24.6	.059	.022	1.143	.502	20.1	7.5	389.6	171.1
3934D1	1	0	35.4	38.3	.041	.011	1.273	.633	14.4	3.9	448.1	222.8
OKLAHOMA												
ALTUS RESERVOIR												
4001B1	2	.548	18.8	18.6	.086	.022	2.292	.943	2.8	.7	74.3	30.6
4001C1	2	.991	26.6	26.7	.208	.022	2.704	1.144	6.0	.6	77.5	32.8
ARBUCKLE LAKE												
4002B1	2	1.528	34.0	33.9	.095	.028	1.501	.171	12.2	3.6	192.4	21.9
LAKE ELLSWORTH												
4003B1	2	0	7.6	7.6	.039	.011	1.020	.372	6.9	1.9	179.6	65.5
4003C1	2	0	18.2	18.2	.047	.012	1.627	.941	8.4	2.2	291.7	168.7
LAKE EUFAULA												
4004B1	2	0	9.2	9.1	.025	.007	.909	.092	8.7	2.4	315.3	31.9
FORT COBB RESERVOIR												
4005A2	2	0	27.0	27.1	.223	.080	2.448	.914	11.7	4.2	128.2	47.9
4005B1	2	.769	30.5	30.5	.223	.061	1.983	.253	10.7	2.9	95.3	12.2
4005C1	2	.795	36.1	36.2	.268	.082	2.114	.578	14.0	4.3	110.8	30.3
FORT SUPPLY RESERVOIR												
4006C1	2	0	16.8	16.8	.077	.035	1.736	1.075	1.6	.7	36.1	22.4
4006D1	2	1.112	16.5	16.5	.060	.020	1.704	.639	1.2	.4	34.2	12.8
4006E1	2	0	9.3	9.3	.082	.018	1.473	.492	1.6	.4	28.9	9.6
4006G1	2	0	10.9	10.9	.092	.046	1.071	.290	1.9	1.0	22.2	6.0
FOSS DAM RESERVOIR												
4007B1	92	0	10.3	10.3	.230	.032	1.830	.270	6.8	1.0	54.4	8.0
4007D1	2	0	18.4	18.4	.066	.018	2.848	.895	2.0	.5	84.3	26.5
GRAND LK O' THE CHEROKEE												
40091L	2	0	12.8	12.5	.021	.012	.655	.269	5.9	3.4	183.0	75.2
40091M	2	0	12.9	12.6	.016	.009	.634	.305	4.5	2.5	177.1	85.2
40092M	2	0	14.3	13.9	.017	.010	.551	.326	4.7	2.8	153.9	91.0
KEYSTONE RESERVOIR												
4011B1	2	0	12.0	12.0	.042	.009	1.250	.114	4.0	.9	118.2	10.8
4011E1	2	0	28.8	28.8	.075	.014	1.312	.112	8.8	1.6	154.1	13.2
4011E2	2	0	27.7	27.7	.058	.011	1.365	.311	8.3	1.6	194.2	44.3
4011F1	2	0	18.4	18.4	.074	.017	1.068	.225	9.8	2.3	141.6	29.8
4011G1	2	0	19.1	19.1	.065	.014	1.182	.330	8.2	1.8	149.0	41.6
4011G2	2	0	19.5	19.5	.058	.015	1.143	.359	7.7	2.0	151.4	47.5
OOLOGAH LAKE												
4012D1	2	0	29.3	29.3	.054	.030	2.049	.517	11.2	6.2	426.5	107.6
4012D2	2	0	18.4	18.3	.038	.027	1.296	.225	7.9	5.6	269.7	46.8
4012E1	2	0	29.5	29.5	.072	.029	1.416	.542	15.0	6.0	294.6	112.8
4012F1	2	0	19.4	19.4	.073	.025	1.303	.190	15.2	5.2	271.3	39.6

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO. [1]	AREA (SQ KM)	LAND USE PERCENTAGES FOR	CL [2]	RA	AG	URB	WET	OTHER	OVERALL LAND USE CATEGORY [3]	GEOLOGY ORIGIN	[4] P-COM (%)	MEAN SLOPE (%)	PH [5]	AVE ANN PRECIP. (CM)	FLOW [6] (CM/SQ KM)
OKLAHOMA															
TENKILLER FERRY RES.															
401381	6.66	46.4	0	5.6	47.9	0	0	.1	MIXED	1010	.042	7.7	4.5	129	.068
LAKE THUNDERBIRD															
4014D1	28.15	10.1	11.0	38.5	37.5	0	.2	2.7	MIXED	1413	.060	4.7	6.5	103	.074
4014E1	25.13	49.2	10.3	15.7	23.9	0	.2	.7	MIXED	1300	.040	5.9	6.5	103	.076
4014F1	13.48	58.9	10.2	22.9	7.2	0	0	.8	50 FOR.	1300	.040	8.6	6.5	103	.040
OREGON															
BROWNLEE RESERVOIR															
4101E1	33.99	13.9	69.2	16.9	0	0	0	0	50 CL.	2400	.141	55.8	6.5	38	.238
4101F1	14.46	.1	0	99.9	0	0	0	0	75 RA.	2426	.192	33.3	6.5	38	.029
4101G1	42.59	6.6	0	93.4	0	0	0	0	75 RA.	2624	.192	38.5	6.5	38	.075
4101J1	19.70	.2	68.8	31.0	0	0	0	0	50 CL.	2624	.192	28.6	6.5	38	.017
4101K1	31.73	0	2.0	98.0	0	0	0	0	75 RA.	2400	.141	32.4	6.5	38	.041
HELLS CANYON RESERVOIR															
4103B1	20.49	38.3	45.8	15.9	0	0	0	0	MIXED	2400	.141	46.2	7.5	39	.369
4103C1	103.40	50.0	21.9	28.1	0	0	0	0	50 FOR.	2624	.192	32.8	7.5	39	1.940
HILLS CREEK RESERVOIR															
41041E	6.39	2.9	.2	8.6	87.8	.5	0	0	75 AG.	2613	.112	11.7	5.0	121	.058
41041G	46.93	6.5	.2	7.8	82.6	0	0	2.9	75 AG.	1326	.112	3.1	5.0	99	.224
41041H	4.02	1.8	0	0	98.2	0	0	0	90 AG.	1315	.040	.6	5.0	99	.019
41041J	6.67	.4	0	0	97.2	0	0	2.4	90 AG.	1315	.040	.9	5.0	99	.031
41041K	10.75	19.7	0	9.3	69.4	0	1.1	.5	50 AG.	2613	.112	15.6	5.0	121	.086
4104B1	30.63	76.0	24.0	0	0	0	0	0	75 FOR.	2626	.151	40.3	4.5	123	.950
4104C1	23.99	87.0	13.0	0	0	0	0	0	75 FOR.	2626	.151	47.2	4.5	123	.744
4104D1	137.36	77.6	22.0	0	0	0	0	.4	75 FOR.	2626	.159	45.6	4.5	123	4.310
OWYHEE RESERVOIR															
4105D1	20.45	.9	.6	97.5	.8	0	0	.2	75 RA.	2600	.244	19.8	7.2	28	.061
SUTTLE LAKE															
41071C	19.22	93.7	2.9	0	0	0	0	3.4	90 FOR.	2626	.184	17.1	4.5	224	.538
41071D	40.79	91.0	4.1	0	0	0	.4	4.5	90 FOR.	2626	.184	10.9	4.5	224	1.061
PENNSYLVANIA															
BLANCHARD RESERVOIR															
4201B1	29.79	51.2	.2	0	46.6	.2	0	1.8	50 FOR.	1013	.046	21.6	5.0	102	.170
4201C1	42.79	40.1	1.0	0	57.6	.4	0	.9	50 AG.	1312	.033	15.0	5.3	102	.100
4201D1	12.90	82.1	0	0	17.7	0	0	.2	50 FOR.	1414	.080	23.7	5.0	102	.050
CONNEAUT LAKE															
4204D1	2.25	42.3	3.0	0	54.0	.4	0	.3	50 AG.	1513	.040	6.1	5.0	102	.050
PYMATUNING RESERVOIR															
4213B1	14.71	32.3	1.8	0	65.2	.4	0	.3	50 AG.	1000	.056	3.7	5.0	94	.130
4213C1	9.89	50.0	3.8	0	43.5	1.1	.7	.9	50 FOR.	1000	.056	2.0	5.0	94	.040
4213F1	39.70	42.1	1.1	0	56.4	0	.1	.3	50 AG.	1000	.050	2.4	5.0	97	.580
4213H1	17.33	38.6	3.0	0	57.6	.4	0	.4	50 AG.	1513	.040	2.7	5.0	97	.210

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
OKLAHOMA												
TENKILLER FERRY RES.												
4013B1	2	0	20.9	20.8	.031	.017	1.127	.204	10.0	5.5	362.9	65.7
LAKE THUNDERBIRD												
4014D1	2	0	16.1	16.2	.077	.016	1.180	.443	6.4	1.3	97.8	36.7
4014E1	2	0	10.3	10.3	.085	.029	.939	.139	8.1	2.8	89.6	13.3
4014F1	2	0	3.1	3.1	.044	.008	.858	.112	4.1	.7	80.3	10.5
OREGON												
BROWNLEE RESERVOIR												
4101E1	0	0	0	0	.031	.020	1.274	.679	6.8	4.4	281.3	149.9
4101F1	0	0	0	0	.097	.073	.928	.243	6.1	4.6	58.7	15.4
4101G1	0	0	0	0	.079	.058	.918	.253	4.4	3.2	51.0	14.1
4101J1	0	0	0	0	.110	.094	.548	.041	3.0	2.6	14.9	1.1
4101K1	0	0	0	0	.096	.070	1.063	.503	3.9	2.9	43.3	20.5
HELLS CANYON RESERVOIR												
4103B1	0	0	0	0	.042	.026	.654	.277	23.9	14.8	371.4	157.3
4103C1	0	0	0	0	.030	.018	1.082	.476	17.8	10.7	640.2	281.6
HILLS CREEK RESERVOIR												
41041E	0	.714	17.4	17.5	.039	.016	1.869	1.245	11.2	4.6	535.0	356.4
41041G	0	1.014	23.0	26.1	.148	.049	1.589	.512	22.3	7.4	239.2	77.1
41041H	0	.761	27.3	31.1	.106	.062	1.403	.414	15.8	9.2	209.1	61.7
41041J	0	.916	27.0	30.8	.111	.068	2.152	1.367	16.3	10.0	315.4	200.4
41041K	0	0	19.3	22.0	.041	.019	.504	.099	10.3	4.8	127.2	25.0
4104B1	0	.734	0	0	.041	.030	.230	.025	40.1	29.3	225.0	24.5
4104C1	0	.643	0	0	.050	.042	.274	.038	48.9	41.1	268.0	37.2
4104D1	0	.873	0	0	.033	.026	.222	.039	32.7	25.7	219.7	38.6
OWYHEE RESERVOIR												
4105D1	0	0	.2	.2	.102	.093	1.241	.485	9.6	8.7	116.7	45.6
SUTTLE LAKE												
41071C	0	.521	0	0	.010	.005	1.470	.035	8.8	4.4	1297.6	30.9
41071D	0	.264	0	0	.010	.005	.380	.020	8.2	4.1	311.7	16.4
PENNSYLVANIA												
BLANCHARD RESERVOIR												
4201B1	1	0	34.5	34.4	.028	.014	2.605	1.895	5.0	2.5	468.8	341.0
4201C1	1	0	42.6	42.5	.026	.008	2.501	1.946	1.9	.6	184.3	143.4
4201D1	1	0	13.1	13.1	.016	.008	.776	.166	2.0	1.0	94.9	20.3
CONNEAUT LAKE												
4204D1	1	0	47.5	47.4	.052	.014	1.115	.553	36.4	9.8	781.4	387.5
PYMATUNING RESERVOIR												
4213B1	1	0	42.8	42.8	.047	.018	1.872	1.239	13.1	5.0	521.7	345.3
4213C1	1	0	28.6	28.6	.086	.028	1.558	.660	11.0	3.6	198.7	84.2
4213F1	1	0	49.6	49.6	.039	.014	1.302	.681	18.0	6.5	599.9	313.8
4213H1	1	0	50.7	50.6	.030	.014	1.798	1.272	11.5	5.4	687.1	486.1

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]						OVERALL LAND USE CATEGORY[3]	GEOLOGY[4]		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	P-COM (%)				
PENNSYLVANIA															
SHENANGO RESERVOIR															
4216F1	7.67	33.1	5.2	0	61.7	0	0	0	50 AG.	1315	.040	7.2	5.0	102	.060
4216G1	22.79	30.4	9.7	0	57.5	2.2	0	.2	50 AG.	1315	.040	5.7	5.0	99	.130
4216H1	9.48	26.7	13.6	0	58.1	1.6	0	0	50 AG.	1315	.040	4.2	5.0	97	.050
BEAVER RUN RESERVOIR															
4219B1	7.10	48.3	2.3	0	48.0	1.4	0	0	MIXED	1514	.080	9.9	4.5	102	.400
LAKE CANADOTHA															
4221B1	8.03	48.6	12.0	0	36.6	0	2.8	0	MIXED	1413	.060	7.5	5.0	107	.130
4221C1	7.28	43.3	9.5	0	47.2	0	0	0	MIXED	1413	.060	4.9	5.0	107	.160
INDIAN LAKE															
4223C1	8.73	92.3	0	0	1.4	3.0	2.1	1.2	50 FOR.	1000	.046	8.8	5.0	112	.120
4223D1	19.30	88.1	0	0	3.4	3.8	3.4	1.3	50 FOR.	1000	.046	8.3	5.0	112	.210
CONEWAGO LAKE															
4226A1	21.21	64.5	1.9	0	33.0	.5	0	.1	50 FOR.	2111	.060	12.3	4.5	99	.580
4226B1	3.55	51.5	3.3	0	45.2	0	0	0	50 FOR.	1121	.060	7.9	4.5	99	.020
4226C1	6.55	56.7	5.4	0	37.9	0	0	0	50 FOR.	2111	.060	13.0	4.5	97	.090
LAKE WALLENPAUPACK															
4229C1	10.08	90.0	3.4	0	5.2	0	0	1.4	75 FOR.	1413	.060	12.3	5.0	109	.170
4229D1	3.65	63.8	3.2	0	23.2	0	0	9.8	50 FOR.	1413	.060	10.3	5.0	112	.060
SOUTH CAROLINA															
HARTWELL RESERVOIR															
4505B1	76.82	59.0	1.0	0	40.0	0	0	0	50 FOR.	3737	.055	8.5	4.5	132	1.070
4505F1	26.21	45.1	5.6	0	48.6	.7	0	0	MIXED	3737	.055	11.8	4.5	137	.440
MARION LAKE															
4506F1	25.15	40.3	.6	0	58.6	0	.2	.3	50 AG.	1800	0	3.3	4.5	112	.220
4506J1	55.24	47.0	2.3	0	48.0	2.0	.7	0	MIXED	1200	.020	1.9	4.5	112	.600
MURRAY LAKE															
4507B1	18.44	51.3	3.0	0	44.4	.7	0	.6	50 FOR.	3611	.040	5.8	4.5	119	.260
4507C1	46.10	57.9	.5	0	39.4	.7	0	1.5	50 FOR.	3611	.040	4.7	4.5	122	.630
ROBINSON LAKE															
4508C1	16.71	30.3	33.0	0	33.7	0	2.6	.4	MIXED	1111	.040	4.8	4.5	122	.180
4508D1	21.19	31.8	23.9	0	43.1	0	.6	.6	MIXED	1111	.040	4.5	4.5	122	.230
4508F1	25.18	41.0	26.2	0	31.6	0	1.0	.2	MIXED	1111	.040	4.2	4.5	119	.260
KEOWEE LAKE															
4513E1	77.78	94.6	.6	0	3.9	.3	0	.6	75 FOR.	3900	.055	18.7	4.5	188	1.910
4513F1	19.99	90.0	.5	0	9.0	0	.1	.4	50 FOR.	3736	.071	23.8	4.5	152	.480
4513G1	30.64	95.1	0	0	4.8	0	0	.1	75 FOR.	3736	.071	26.0	4.5	173	.760
SECESSION LAKE															
4514E1	8.39	39.3	2.3	0	58.1	0	0	.3	50 AG.	3736	.055	6.3	4.5	122	.100
WILLIAM C. BOWEN LAKE															
4516B1	11.50	49.5	9.5	0	39.3	.7	0	1.0	MIXED	3736	.055	8.5	4.5	137	.130
4516C1	9.12	40.2	2.7	0	55.3	1.5	0	.3	50 AG.	3736	.055	9.4	4.5	127	.100

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS	7	DRAINAGE	ANIMAL DENSITY		MEAN CONCENTRATIONS				EXPORT			
STORET NO.	TAG	DENSITY (KM/SQ KM)	(AN UNITS/SQ KM) TOT P	TOT N	(MG/L) TOT P	ORTHO P	TOT N	INORG N	(KG/SQ KM) TOT P	ORTHO P	TOT N	INORG N
PENNSYLVANIA												
SHENANGO RESERVOIR												
4216F1	1	0	50.0	50.0	.041	.020	2.092	1.143	10.1	4.9	516.1	282.0
4216G1	1	0	46.6	46.6	.030	.011	1.619	.568	5.4	2.0	291.2	102.2
4216H1	1	0	47.0	47.0	.037	.016	1.559	.696	6.2	2.7	259.3	115.8
BEAVER RUN RESERVOIR												
4219B1	1	0	36.4	36.5	.123	.060	1.644	.864	218.5	106.6	2920.9	1535.0
LAKE CANADOTHA												
4221B1	1	0	28.8	28.8	.038	.013	1.416	.336	19.4	6.6	722.9	171.5
4221C1	1	0	38.6	38.5	.024	.007	1.443	.492	16.6	4.9	1000.1	341.0
INDIAN LAKE												
4223C1	1	.850	1.2	1.2	.012	.006	1.460	.370	5.2	2.6	632.9	160.4
4223D1	1	.960	2.8	2.8	.021	.006	1.705	.810	7.2	2.1	585.0	277.9
CONEWAGO LAKE												
4226A1	1	0	25.0	24.5	.022	.008	1.238	.299	19.0	6.9	1067.6	257.8
4226B1	1	0	34.2	33.6	.028	.007	1.006	.442	5.0	1.2	178.7	78.5
4226C1	1	0	28.7	28.2	.022	.006	.881	.453	9.5	2.6	381.8	196.3
LAKE WALLENPAUPACK												
4229C1	1	.640	5.7	5.5	.020	.008	1.117	.184	10.6	4.3	594.1	97.9
4229D1	1	0	24.4	24.5	.023	.009	1.081	.521	11.9	4.7	560.4	270.1
SOUTH CAROLINA												
HARTWELL RESERVOIR												
4505B1	1	0	30.4	30.1	.030	.008	.933	.290	13.2	3.5	409.8	127.4
4505F1	1	0	52.5	51.0	.028	.009	.852	.425	14.8	4.8	451.1	225.0
MARION LAKE												
4506F1	1	0	15.0	14.4	.064	.023	1.432	1.051	17.7	6.3	395.0	289.9
4506J1	1	0	17.0	16.2	.084	.029	1.137	.344	28.8	9.9	389.5	117.8
MURRAY LAKE												
4507B1	1	0	36.7	38.7	.037	.018	.733	.388	16.5	8.0	325.9	172.5
4507C1	1	0	32.6	34.4	.063	.024	.641	.200	27.2	10.3	276.3	86.2
ROBINSON LAKE												
4508C1	1	0	26.5	21.8	.007	.005	.537	.181	2.4	1.7	182.4	61.5
4508D1	1	0	33.8	27.9	.014	.006	.481	.101	4.8	2.1	164.6	34.6
4508F1	1	0	24.8	20.5	.018	.006	.688	.369	5.9	2.0	224.0	120.2
KEOWEE LAKE												
4513E1	1	1.670	4.1	4.0	.024	.007	.275	.058	18.6	5.4	213.0	44.9
4513F1	1	0	9.7	9.5	.025	.008	.312	.069	18.9	6.1	236.3	52.2
4513G1	1	2.180	5.2	5.0	.019	.006	.628	.098	14.9	4.7	491.2	76.7
SECESSION LAKE												
4514E1	1	0	44.2	43.8	.023	.012	1.104	.459	8.6	4.5	415.0	172.5
WILLIAM C. BOWEN LAKE												
4516B1	1	0	25.8	25.6	.020	.007	.535	.220	7.1	2.5	190.7	78.4
4516C1	1	0	36.2	36.0	.020	.007	.736	.371	6.9	2.4	254.5	128.3

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS [1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES [2] FOR	CL	RA	AG	URB	WET	OTHER	OVERALL LAND USE CATEGORY [3]	GEOLOGY [4] ORIGIN	P-COM (%)	MEAN SLOPE (%)	PH [5]	AVE ANN PRECIP. (CM)	FLOW [6] (CM/SQ KM)
SOUTH DAKOTA															
LAKE ALVIN															
46021B	26.31	1.5	.5	0	97.4	0	.4	.2	90 AG.	1214	.040	2.1	6.0	58	.025
46021C	37.17	1.0	2.2	0	96.1	0	.3	.4	90 AG.	1034	.055	.8	6.0	58	.036
LAKE COCHRAN															
46081A	28.38	.4	5.5	0	92.9	0	1.1	.1	90 AG.	1400	.080	3.8	7.2	66	.048
DEERFIELD LAKE															
4610A2	203.71	85.4	3.2	10.1	1.3	0	0	0	75 FOR.	1030	.045	14.7	7.0	52	.270
4610A3	70.00	84.9	5.2	8.3	1.5	0	0	.1	75 FOR.	1030	.045	20.3	7.0	52	.094
4610B1	16.79	86.1	3.3	5.6	5.0	0	0	0	75 FOR.	3000	.040	20.5	7.0	52	.022
LAKE HERMAN															
4612B1	28.45	1.2	.2	0	96.5	0	2.1	0	90 AG.	1400	.080	3.2	7.2	68	.009
4612C1	47.23	.1	.9	0	98.1	0	.9	0	90 AG.	1400	.080	3.0	7.2	68	.028
LAKE MADISON															
46151C	20.25	3.8	0	0	95.2	0	.7	.3	90 AG.	1400	.080	2.2	7.2	68	.009
46191D	36.26	3.1	0	0	96.5	0	.2	.2	90 AG.	1400	.080	2.1	7.2	68	.016
PACTOLA RESERVOIR															
4620C1	26.08	87.8	5.9	2.7	3.6	0	0	0	75 FOR.	3010	.043	22.1	7.0	52	.052
4620D1	16.12	84.9	1.3	11.7	2.1	0	0	0	75 FOR.	3000	.142	20.1	7.0	46	.042
4620E1	23.09	92.6	1.8	4.4	1.2	0	0	0	90 FOR.	3011	.050	19.2	7.0	46	.060
4620F1	34.29	68.7	.5	21.6	9.2	0	0	0	50 FOR.	3010	.043	19.0	7.0	46	.055
RICHMOND LAKE															
4624B1	23.50	.5	0	24.2	74.1	0	1.0	.2	50 AG.	1400	.080	1.3	7.5	46	.001
STOCKADE LAKE															
4627B1	27.85	73.7	21.2	0	5.0	.1	0	0	50 FOR.	3022	.064	31.7	7.0	45	.039
SHERIDAN LAKE															
4628A3	47.23	81.7	.8	8.2	9.3	0	0	0	50 FOR.	3022	.064	15.4	7.0	44	.086
4628C1	24.47	58.8	.5	24.0	16.2	0	0	.5	50 FOR.	3000	.142	15.1	7.0	44	.045
TENNESSEE															
BARKLEY LAKE															
4701F1	44.68	78.3	3.4	0	17.8	0	.2	.3	50 FOR.	1212	.020	16.2	4.5	119	.660
4701G1	105.44	54.4	27.0	0	18.3	.2	0	.1	50 FOR.	1212	.020	12.8	4.5	122	1.540
4701J1	49.68	48.9	9.7	0	40.4	.8	0	.2	MIXED	1212	.020	15.7	4.5	122	.710
4701N1	28.13	53.8	5.4	0	40.3	.3	0	.2	50 FOR.	1212	.020	18.7	4.5	122	.390
4701P1	431.03	58.0	6.0	0	35.2	.3	.1	.4	50 FOR.	1212	.020	16.4	4.5	122	6.070
4701R1	29.09	87.0	2.7	0	10.0	.3	0	0	50 FOR.	1213	.030	20.3	4.5	127	.410
4701S1	30.04	82.2	1.6	0	15.8	.1	.2	.1	50 FOR.	1213	.030	16.1	4.5	130	.420
4701T1	23.41	90.5	.7	0	8.6	0	0	.2	50 FOR.	1212	.020	19.0	4.5	130	.330
4701U1	25.95	79.4	.8	0	19.4	0	0	.4	50 FOR.	1412	.040	16.2	4.5	127	.360
BOONE RESERVOIR															
4704B1	33.54	18.2	7.4	0	72.7	1.4	0	.3	50 AG.	1214	.035	15.5	4.5	112	.380
4704C1	7.49	18.5	3.8	0	68.6	8.8	0	.3	50 AG.	1214	.035	10.2	4.5	112	.080
4704G1	8.60	18.5	6.4	0	73.7	1.4	0	0	50 AG.	1214	.050	15.3	4.5	112	.100
4704H1	5.70	17.7	11.8	0	63.0	7.5	0	0	50 AG.	1215	.055	14.4	4.5	112	.060
4704J1	42.14	56.4	6.4	0	36.3	.5	0	.4	50 FOR.	1412	.050	34.9	4.5	112	.670
4704K1	17.90	79.9	1.2	0	18.9	0	0	0	50 FOR.	1411	.070	45.2	4.5	112	.280
4704L1	31.00	78.8	3.4	0	17.8	0	0	0	50 FOR.	1413	.060	41.7	4.5	112	.490

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
SOUTH DAKOTA												
LAKE ALVIN												
46021B	2	.941	50.5	50.6	.205	.089	1.504	.438	6.1	2.7	45.1	13.1
46021C	2	.786	49.8	49.9	.140	.091	1.907	.985	4.3	2.8	58.2	30.1
LAKE COCHRAN												
46081A	2	1.200	32.6	32.5	.036	.011	1.735	.766	1.9	.6	92.5	40.9
DEERFIELD LAKE												
4610A2	0	.622	.2	.2	.030	.012	.615	.117	1.3	.5	25.7	4.9
4610A3	0	.506	.2	.2	.027	.010	.537	.168	1.1	.4	22.7	7.1
4610B1	0	1.476	.7	.7	.064	.035	.903	.061	2.6	1.4	37.3	2.5
LAKE HERMAN												
4612B1	92	.912	44.5	44.6	.520	.300	5.460	2.640	5.2	3.0	54.5	26.3
4612C1	2	.979	45.2	45.3	.367	.203	2.942	.790	6.9	3.8	55.0	14.8
LAKE MADISON												
46151C	92	.808	43.9	44.0	.693	.535	5.367	2.773	9.7	7.5	75.2	38.9
46151D	2	.864	44.2	44.6	.321	.262	2.650	1.089	4.5	3.6	36.9	15.2
PACTOLA RESERVOIR												
4620C1	0	.730	.5	.5	.031	.008	.614	.107	1.9	.5	38.6	6.7
4620D1	0	.911	.4	.4	.012	.006	.452	.144	1.0	.5	37.1	11.8
4620E1	0	1.383	.2	.2	.022	.015	.518	.117	1.8	1.2	42.4	9.6
4620F1	0	0	1.2	1.2	.032	.015	.498	.075	1.6	.8	25.2	3.8
RICHMOND LAKE												
4624B1	2	0	22.0	22.4	.704	.575	2.760	.252	1.0	.9	2.6	.2
STOCKADE LAKE												
4627B1	0	1.541	.7	.7	.023	.012	.802	.123	1.0	.5	35.4	5.4
SHERIDAN LAKE												
4628A3	0	0	1.2	1.3	.065	.026	1.931	.063	3.7	1.5	110.9	3.6
4628C1	0	0	2.2	2.2	.053	.027	1.659	.063	3.1	1.6	96.2	3.7
TENNESSEE												
BARKLEY LAKE												
4701F1	1	0	11.7	11.6	.017	.010	.782	.433	7.9	4.7	364.3	201.7
4701G1	1	0	11.8	11.6	.064	.012	1.084	.422	29.5	5.5	499.3	194.4
4701J1	1	0	24.8	24.4	.016	.008	.837	.464	7.2	3.6	377.2	209.1
4701N1	1	0	32.3	32.0	.032	.013	.650	.228	14.0	5.7	284.2	99.7
4701P1	1	0	30.1	29.9	.059	.023	.725	.285	26.2	10.2	322.0	126.6
4701R1	1	0	6.1	6.1	.023	.013	.610	.208	10.2	5.8	271.1	92.5
4701S1	1	0	9.7	9.6	.024	.014	.598	.291	10.6	6.2	263.7	128.3
4701T1	1	0	5.3	5.2	.021	.014	.426	.168	9.3	6.2	189.4	74.7
4701U1	1	0	11.9	11.7	.010	.007	1.225	.576	4.4	3.1	535.9	252.0
BOONE RESERVOIR												
4704B1	1	0	78.4	77.8	.039	.014	1.802	1.315	13.9	5.0	643.8	469.8
4704C1	1	0	73.9	73.4	.040	.016	2.274	1.852	13.5	5.4	766.0	623.8
4704G1	1	0	64.3	64.1	.097	.046	2.315	1.631	35.6	16.9	848.9	598.1
4704H1	1	0	55.0	54.8	.019	.010	2.378	1.845	6.3	3.3	789.4	612.5
4704J1	1	0	31.5	31.5	.029	.013	1.486	.967	14.5	6.5	745.1	484.9
4704K1	1	0	16.5	16.4	.024	.011	.494	.199	11.8	5.4	243.7	98.2
4704L1	1	0	15.5	15.5	.027	.016	1.037	.411	13.5	8.0	516.9	204.9

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1]	AREA	LAND USE PERCENTAGES[2]							OVERALL LAND USE[3]	GEOLOGY[4]		MEAN		AVE ANN	FLOW[6]
STORET NO.	(SQ KM)	FOR	CL	RA	AG	URB	WET	OTHER	CATEGORY	ORIGIN	P-COM (%)	SLOPE (%)	PH[5]	PRECIP. (CM)	(CM/SQ KM)
TENNESSEE															
CHEROKEE LAKE															
4707B1	49.91	49.4	10.7	0	38.8	1.1	0	0	MIXED	1113	.054	29.2	5.0	114	.670
4707C1	13.13	65.7	12.8	0	21.5	0	0	0	50 FOR.	1000	.035	42.6	4.5	122	.170
CHICKAMAUGA LAKE															
4708D1	72.21	49.9	3.3	0	46.7	0	0	.1	MIXED	1012	.047	12.2	4.5	142	1.200
4708E1	35.04	51.5	3.1	0	45.4	0	0	0	50 FOR.	1012	.038	12.4	4.5	142	.600
4708K1	41.70	43.8	4.4	0	51.2	0	0	.6	50 AG.	1214	.048	13.4	4.5	132	.730
4708M1	57.16	61.3	3.2	0	33.8	1.7	0	0	50 FOR.	1010	.040	15.0	4.5	132	1.010
4708R1	44.96	55.4	5.5	0	38.7	.2	0	.2	50 FOR.	1200	.020	16.2	5.0	122	1.050
DOUGLAS LAKE															
4711B1	78.50	30.0	2.0	0	64.6	.3	0	3.1	50 AG.	1412	.050	16.4	4.5	112	.760
4711D1	44.50	50.8	4.9	0	43.6	.2	.1	.4	50 FOR.	1400	.080	30.0	7.0	112	.820
4711K1	3.94	25.6	.5	0	66.7	6.7	0	.5	50 AG.	1200	.020	15.1	4.5	112	.040
FT. LOUDOUN LAKE															
4712C1	48.90	15.1	11.2	0	16.3	57.0	0	.4	URBAN	1412	.050	10.3	5.0	137	.810
4712E1	42.71	16.8	20.4	0	6.5	56.3	0	0	URBAN	1412	.050	10.2	5.0	142	.710
4712F1	24.97	11.3	33.2	0	0	55.3	0	.2	URBAN	1200	.020	10.3	5.0	142	.410
4712H1	29.14	35.4	4.0	0	58.5	1.8	0	.3	50 AG.	1412	.050	12.3	4.5	127	.610
4712J1	26.44	30.7	5.8	0	61.2	1.9	0	.4	50 AG.	1214	.038	9.9	4.5	127	.420
4712L1	49.11	57.1	5.2	0	35.0	2.4	0	.3	50 FOR.	1214	.038	18.0	4.5	122	1.050
4712P1	7.54	29.2	13.8	0	0	56.4	0	.6	URBAN	1214	.044	13.1	4.5	132	.130
4712Q1	6.63	27.2	11.5	0	0	60.2	0	1.1	URBAN	1412	.056	13.8	4.5	132	.110
NICKAJACK RESERVOIR															
4717E1	59.03	92.1	.5	0	4.7	0	0	2.7	75 FOR.	1111	.060	19.6	5.0	132	1.500
4717M1	10.49	99.8	.2	0	0	0	0	0	90 FOR.	1100	.064	25.4	5.0	127	.270
4717N1	4.69	99.8	.2	0	0	0	0	0	90 FOR.	1100	.056	23.7	5.0	124	.120
4717P1	3.39	100.0	0	0	0	0	0	0	90 FOR.	1100	.064	28.5	5.0	124	.090
4717Q1	3.89	99.2	.7	0	0	0	0	.1	90 FOR.	1100	.064	24.3	5.0	124	.100
4717R1	2.38	99.9	.1	0	0	0	0	0	90 FOR.	1100	.064	25.8	5.0	124	.060
4717T1	42.37	97.2	1.0	0	.9	0	0	.9	90 FOR.	1100	.058	19.3	5.0	124	1.350
OLD HICKORY LAKE															
4720C1	36.88	28.5	4.3	0	65.6	.6	0	1.0	50 AG.	1812	0	13.9	5.3	124	.680
4720F1	79.41	20.3	5.9	0	73.2	.5	0	.1	50 AG.	1512	.020	5.4	5.3	124	1.470
PERCY PRIEST RESERVOIR															
4723F1	28.59	35.4	2.4	0	59.4	.4	0	2.4	50 AG.	1812	0	7.9	5.3	119	.400
TIMS FORD RESERVOIR															
4724E1	8.55	48.7	7.1	0	44.2	0	0	0	MIXED	1214	.032	10.6	4.5	137	.140
4724F1	21.37	67.5	7.3	0	24.8	.3	0	.1	50 FOR.	1412	.050	11.0	4.5	137	.360
REELFOOT LAKE															
4727C1	21.86	63.8	9.6	0	24.8	0	0	1.8	50 FOR.	1500	0	22.7	6.0	122	.250
TEXAS															
LAKE BASTROP															
48021B	58.47	.6	2.9	6.7	89.5	.3	0	0	75 AG.	1011	.054	2.9	7.2	124	.234
48021C	83.96	0	4.1	8.3	87.2	0	0	.4	75 AG.	1011	.054	3.0	7.2	124	.336
48022C	103.48	1.0	4.7	8.2	85.7	0	0	.4	75 AG.	1011	.054	3.6	7.2	124	.414

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM) TOT P	ANIMAL DENSITY (AN UNITS/SQ KM) TOT N	MEAN CONCENTRATIONS (MG/L) TOT P	MEAN CONCENTRATIONS (MG/L) ORTHO P	MEAN CONCENTRATIONS (MG/L) TOT N	MEAN CONCENTRATIONS (MG/L) INORG N	EXPORT (KG/SQ KM) TOT P	EXPORT (KG/SQ KM) ORTHO P	EXPORT (KG/SQ KM) TOT N	EXPORT (KG/SQ KM) INORG N
TENNESSEE												
CHEROKEE LAKE												
4707B1	1	0	31.7	31.7	.041	.016	1.115	.573	17.4	6.8	472.0	242.6
4707C1	1	0	17.6	17.5	.057	.041	1.363	.350	23.3	16.7	556.5	142.9
CHICKAMAUGA LAKE												
4708D1	1	0	52.9	52.1	.031	.015	1.152	.571	16.2	7.9	603.7	299.2
4708E1	1	0	50.1	51.0	.037	.018	.896	.381	20.0	9.7	483.8	205.7
4708K1	1	0	53.1	53.2	.041	.018	.971	.358	22.6	9.9	536.1	197.6
4708M1	1	0	30.5	31.3	.033	.020	.771	.302	18.4	11.1	429.6	168.3
4708R1	1	0	35.9	35.5	.030	.011	1.050	.557	22.1	8.1	773.3	410.2
DOUGLAS LAKE												
4711B1	1	0	75.6	75.0	.026	.013	1.482	1.028	7.9	4.0	452.5	313.9
4711D1	1	0	38.4	39.1	.032	.016	.978	.279	18.6	9.3	568.3	162.1
4711K1	1	0	69.8	69.2	.022	.013	2.013	.988	7.0	4.2	644.5	316.3
FT. LOUDOUN LAKE												
4712C1	1	0	15.6	15.4	.113	.051	1.797	1.157	59.0	26.6	938.7	604.4
4712E1	1	0	6.2	6.2	.107	.055	2.508	1.699	56.1	28.8	1314.8	890.7
4712F1	1	0	0	0	.092	.030	1.930	1.072	47.6	15.5	999.4	555.1
4712H1	1	0	66.3	65.9	.039	.018	1.350	.815	25.7	11.9	891.2	538.0
4712J1	1	0	69.4	68.9	.022	.007	1.420	.753	11.0	3.5	711.3	377.2
4712L1	1	0	33.5	33.1	.049	.018	.851	.375	33.0	12.1	573.8	252.8
4712P1	1	0	0	0	.083	.048	1.668	1.197	45.1	26.1	906.9	650.8
4712Q1	1	0	0	0	.048	.023	1.842	1.413	25.1	12.0	963.8	739.3
NICKAJACK RESERVOIR												
4717E1	1	1.390	4.6	4.9	.009	.005	.461	.112	7.2	4.0	369.4	89.8
4717M1	1	1.370	0	0	.007	.007	1.107	.249	5.7	5.7	898.6	202.1
4717N1	1	1.410	0	0	.006	.005	.407	.087	4.8	4.0	328.4	70.2
4717P1	1	1.350	0	0	.006	.005	.495	.060	5.0	4.2	414.4	50.2
4717Q1	1	2.120	0	0	.006	.005	.415	.078	4.9	4.1	336.4	63.2
4717R1	1	1.820	0	0	.005	.005	.374	.065	4.0	4.0	297.3	51.7
4717T1	1	1.580	.1	.1	.006	.005	.546	.083	6.0	5.0	548.6	83.4
OLD HICKORY LAKE												
4720C1	1	0	63.5	63.5	.149	.086	.975	.226	86.6	50.0	566.9	131.4
4720F1	1	0	70.9	70.9	.166	.102	1.260	.416	96.9	59.5	735.6	242.9
PERCY PRIEST RESERVOIR												
4723F1	1	0	65.7	65.6	.132	.079	.753	.277	58.2	34.9	332.2	122.2
TIMS FORD RESERVOIR												
4724E1	1	0	53.1	52.7	.035	.012	.774	.239	18.1	6.2	399.7	123.4
4724F1	1	0	29.8	29.6	.032	.011	.729	.245	17.0	5.8	387.3	130.2
REELFOOT LAKE												
4727C1	1	0	12.8	12.6	.127	.058	.556	.134	45.8	20.9	200.5	48.3
TEXAS												
LAKE BASTROP												
48021B	92	1.005	21.9	22.2	.080	.030	2.510	.507	10.1	3.8	316.8	64.0
48021C	92	1.149	21.3	21.6	.342	.043	3.793	2.688	43.2	5.4	478.7	339.2
48022C	92	1.148	21.0	21.3	.353	.042	2.330	.944	44.5	5.3	294.0	119.1

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2] FOR	CL	RA	AG	URB	WET	OTHER	OVERALL LAND USE CATEGORY[3]	GEOLOGY[4] ORIGIN	P-COM (%)	MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
TEXAS															
BELTON RESERVOIR															
4803C1	99.68	50.8	27.9	0	21.1	0	0	.2	50 FOR.	1019	.060	5.4	7.2	119	.407
LAKE BROWNWOOD															
4805E1	19.66	23.1	2.9	28.7	43.2	0	0	2.1	MIXED	1011	.061	2.6	6.5	89	.024
LAKE BUCHANAN															
4806B1	7.29	37.0	9.0	43.8	9.9	0	0	.3	MIXED	2200	.087	11.1	7.2	83	.015
4806E1	49.79	34.1	38.7	22.5	4.3	0	0	.4	MIXED	1412	.050	9.2	7.2	104	.099
4806F1	50.84	31.3	30.5	19.2	18.4	0	0	.6	MIXED	1000	.050	8.2	7.2	104	.106
CALAVARAS LAKE															
4808A2	31.37	17.2	6.1	10.1	63.2	2.4	0	1.0	50 AG.	1111	.065	2.5	6.8	92	.044
EAGLE MOUNTAIN RESERVOIR															
4813E1	34.70	3.2	4.5	68.0	20.8	.8	0	2.7	50 RAA.	1010	.055	4.3	6.5	149	.121
GARZA LITTLE ELM RES.															
4815G1	124.67	9.8	.3	19.9	67.9	0	.2	1.9	50 AG.	1411	.060	3.0	6.5	129	.698
4815H1	33.15	15.0	.5	0	83.0	1.0	0	.5	75 AG.	1417	.080	2.5	6.5	129	.186
4815J1	74.97	5.2	.5	22.3	70.6	0	.2	1.2	50 AG.	1411	.060	1.7	6.5	129	.420
4815K1	31.65	3.2	2.9	23.1	70.8	0	0	0	50 AG.	1417	.080	1.5	6.8	129	.335
4815L1	59.87	2.8	1.7	23.1	72.1	0	0	.3	50 AG.	1411	.060	1.7	6.8	129	.177
HOUSTON LAKE															
4817N1	11.29	97.8	.5	0	1.5	0	0	.2	90 FOR.	1111	.040	3.9	4.5	178	.078
4817P1	13.60	96.8	2.3	0	.9	0	0	0	90 FOR.	1111	.040	2.6	4.5	178	.088
LAKE O' THE PINES															
4818B1	8.79	52.2	2.3	8.0	36.2	0	0	1.3	50 FOR.	1317	.040	6.1	4.5	151	.058
4818C1	20.27	70.2	3.9	.6	23.6	0	.8	.9	50 FOR.	1317	.040	7.4	4.5	151	.294
4818D1	14.99	82.6	1.1	0	16.1	0	0	.2	50 FOR.	1317	.040	10.6	4.5	151	.238
4818F1	12.86	81.6	.8	3.4	12.7	1.3	.2	0	50 FOR.	1317	.040	7.9	4.5	151	.186
4818G1	88.15	69.6	1.9	0	27.5	.6	0	.4	50 FOR.	1317	.040	6.1	4.5	151	1.119
4818H1	93.95	41.8	3.2	0	52.0	.8	0	2.2	50 AG.	1317	.040	4.2	4.5	151	.619
4818K1	61.95	36.4	1.2	.9	61.0	0	0	.5	50 AG.	1317	.040	3.3	4.5	164	.793
4818K2	44.99	20.0	1.2	1.2	76.9	0	0	.7	75 AG.	1317	.040	3.8	4.5	164	.296
4818P1	57.94	80.5	4.6	4.7	6.3	.2	.5	3.2	75 FOR.	1317	.040	6.7	4.5	151	.840
LAKE LAVON															
4819C1	19.38	4.1	1.4	10.6	81.9	.9	0	1.1	75 AG.	1210	.028	2.2	7.2	119	.149
LIVINGSTON LAKE															
4820B1	51.96	86.1	4.6	2.5	6.2	.6	0	0	75 FOR.	1100	.050	6.7	4.5	156	.188
4820C1	31.29	76.8	2.1	0	19.3	.4	0	1.4	50 FOR.	1100	.050	4.7	4.5	156	.118
4820D1	39.05	73.7	.8	1.8	21.7	0	0	2.0	50 FOR.	1100	.050	4.0	4.5	156	.146
4820H1	100.84	91.0	.5	0	7.1	0	0	1.4	50 FOR.	1100	.050	2.5	4.5	156	.460
LYNDON B. JOHNSON LAKE															
4821B1	23.34	2.4	0	88.3	4.9	3.7	0	.7	75 RA.	1211	.038	4.9	6.8	108	.046
4821C1	63.39	.6	0	98.0	.9	0	0	.5	75 RA.	3110	.051	6.0	6.8	108	.128
4821E1	99.55	23.9	.7	71.7	2.2	0	0	1.5	50 RAF.	3131	.070	10.9	6.8	83	.212
4821H1	25.03	11.7	0	85.1	3.2	0	0	0	75 RA.	3110	.063	6.7	6.8	104	.053

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
TEXAS												
BELTON RESERVOIR												
4803C1	2	0	5.0	5.3	.013	.006	.991	.668	1.7	.8	127.6	86.0
LAKE BROWNWOOD												
4805E1	2	0	12.9	13.4	.065	.011	1.014	.050	2.5	.4	39.0	1.9
LAKE BUCHANAN												
4806B1	2	0	2.3	2.3	.017	.008	.225	.040	1.1	.5	14.6	2.6
4806E1	2	0	.9	1.0	.010	.006	.746	.389	.6	.4	46.8	24.4
4806F1	2	0	4.0	4.4	.011	.005	1.107	.760	.7	.3	72.8	50.0
CALAVARAS LAKE												
4808A2	2	0	29.8	29.8	.114	.035	1.215	.257	5.0	1.5	53.7	11.4
EAGLE MOUNTAIN RESERVOIR												
4813E1	2	0	8.9	8.9	.042	.009	1.071	.193	4.6	1.0	117.8	21.2
GARZA LITTLE ELM RES.												
4815G1	2	0	25.3	25.2	.208	.066	1.640	.478	36.7	11.7	289.6	84.4
4815H1	2	1.130	30.9	30.9	.108	.020	1.584	.534	19.1	3.5	280.3	94.5
4815J1	2	0	26.3	26.2	.209	.079	1.704	.463	36.9	14.0	301.0	81.8
4815K1	2	0	26.4	26.3	.239	.109	1.952	.510	42.2	19.2	344.3	89.9
4815L1	2	0	26.8	26.8	.207	.100	1.735	.420	36.5	17.6	306.2	74.1
HOUSTON LAKE												
4817N1	2	0	.5	.5	.013	.006	.352	.078	2.8	1.3	76.7	17.0
4817P1	2	0	.3	.3	.026	.010	.718	.094	5.3	2.0	146.5	19.2
LAKE O' THE PINES												
4818B1	2	0	14.0	14.0	.032	.010	.568	.156	6.7	2.1	118.2	32.5
4818C1	2	0	9.7	9.7	.031	.011	.469	.102	14.2	5.0	214.5	46.7
4818D1	2	0	8.7	8.9	.025	.008	.524	.088	12.5	4.0	262.4	44.1
4818F1	2	0	7.3	7.4	.033	.015	.695	.096	15.1	6.8	317.0	43.8
4818G1	2	0	15.3	15.6	.049	.018	.649	.136	19.6	7.2	259.8	54.4
4818H1	2	0	31.8	32.0	.098	.048	1.400	.449	20.4	10.0	290.9	93.3
4818K1	2	0	17.5	17.7	.079	.021	.847	.178	31.9	8.5	341.9	71.9
4818K2	2	1.118	22.1	22.3	.058	.020	.893	.207	12.0	4.1	185.3	42.9
4818P1	2	0	2.5	2.6	.027	.009	.401	.096	12.3	4.1	183.3	43.9
LAKE LAVON												
4819C1	2	.865	22.5	22.7	.026	.015	2.241	1.355	6.3	3.6	543.4	328.5
LIVINGSTON LAKE												
4820B1	2	0	2.2	2.2	.029	.019	.726	.093	3.3	2.2	82.8	10.6
4820C1	2	0	6.5	6.5	.021	.015	.770	.049	2.5	1.8	91.6	5.8
4820D1	2	0	6.9	6.9	.067	.044	.911	.069	7.9	5.2	107.4	8.1
4820H1	2	0	1.8	1.8	.028	.009	.790	.074	4.0	1.3	113.6	10.6
LYNDON B. JOHNSON LAKE												
4821B1	2	0	1.1	1.1	.011	.006	.615	.092	.7	.4	38.2	5.7
4821C1	2	0	.2	.2	.013	.007	.591	.108	.8	.4	37.6	6.9
4821E1	2	0	.5	.5	.011	.007	.640	.116	.7	.5	43.0	7.8
4821H1	2	0	.7	.8	.012	.006	.513	.218	.8	.4	34.3	14.6

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES							OVERALL LAND USE CATEGORY[3]	GEOLOGY		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL[2]	RA	AG	URB	WET	OTHER		ORIGIN	[4] P-COM (%)				
TEXAS															
MEDINA RESERVOIR															
4822A3	363.21	50.7	14.7	22.2	11.7	0	0	.7	50 FOR.	1212	.020	23.9	7.2	100	.777
4822A4	273.16	50.4	13.3	23.2	12.2	0	0	.9	50 FOR.	1212	.020	22.8	7.2	100	.584
4822B1	149.16	52.2	1.8	35.9	9.5	.1	0	.5	50 FOR.	1212	.020	16.6	6.8	107	.310
4822C1	32.96	49.7	1.3	45.4	3.6	0	0	0	MIXED	1212	.020	15.8	7.2	107	.082
PALESTINE RESERVOIR															
4824E1	29.16	40.7	4.7	26.3	21.8	1.4	1.6	3.5	MIXED	1311	.060	7.2	4.5	140	.196
4824F1	20.16	26.0	.4	63.9	6.9	1.2	0	1.6	50 RAF.	1311	.060	7.0	4.5	140	.135
SAM RAYBURN RESERVOIR															
4827D1	41.74	46.1	0	47.6	5.1	.5	0	.7	MIXED	1719	0	4.1	4.5	170	.178
4827G1	68.90	92.3	5.6	1.5	.2	.2	0	.2	90 FOR.	1111	.040	7.5	4.5	207	.202
4827H1	18.73	88.8	4.6	0	6.4	0	0	.2	75 FOR.	1111	.040	8.9	4.5	207	.051
4827J1	13.67	98.8	.9	.3	0	0	0	0	90 FOR.	1100	.040	8.2	4.5	207	.037
4827K1	7.47	99.4	.6	0	0	0	0	0	90 FOR.	1111	.040	6.1	4.5	207	.031
4827L1	10.81	98.9	1.1	0	0	0	0	0	90 FOR.	1111	.040	7.1	4.5	207	.029
4827P1	11.59	92.3	1.3	1.6	4.8	0	0	0	75 FOR.	1111	.080	3.0	4.5	170	.063
4827Q1	24.41	72.6	23.3	0	3.7	0	0	.4	50 FOR.	1111	.080	3.4	4.5	170	.104
SOMERVILLE LAKE															
4829F1	121.18	35.5	2.5	.5	59.3	0	0	2.2	50 AG.	1000	.040	2.3	6.8	123	.705
STILLHOUSE HOLLOW RES.															
4831C1	158.93	19.7	3.2	54.6	21.1	0	0	1.4	50 RAA.	1000	.040	4.9	6.5	95	.386
TEXARKANA RESERVOIR															
4833J1	42.24	39.4	3.3	8.2	47.5	0	0	1.6	MIXED	1110	.090	7.2	4.5	164	.310
TEXOMA LAKE															
4834F1	44.67	11.7	.6	65.9	20.2	0	.1	1.5	50 RAA.	2215	.078	5.2	6.8	111	.223
4834G1	45.45	18.2	0	3.0	78.3	0	0	.5	75 AG.	1117	.060	7.3	4.5	120	.250
4834H1	51.42	7.9	1.0	40.9	49.6	0	0	.6	MIXED	1510	.060	5.1	6.5	111	.211
TRAVIS LAKE															
4835B1	24.29	40.0	9.2	50.6	0	0	0	.2	50 RAF.	1000	.038	15.3	6.5	108	.097
4835D1	21.15	6.6	.1	71.1	22.1	0	0	.1	50 RAA.	1000	.050	3.4	6.5	108	.068
4835E1	50.06	9.5	0	78.5	11.6	0	0	.4	75 RA.	3100	.040	5.1	6.5	108	.160
4835F1	78.45	25.5	1.6	64.6	8.3	0	0	0	50 RAF.	3100	.040	11.7	6.5	108	.026
WHITNEY RESERVOIR															
4839E1	61.91	28.3	7.8	46.5	14.8	.2	0	2.4	MIXED	1010	.032	6.2	6.5	95	.310
4839J1	38.76	1.1	75.7	22.6	0	0	0	.6	75 CL.	1010	.032	3.0	6.5	95	.155
UTAH															
BEAR LAKE															
4901C1	11.64	3.9	17.8	77.7	0	0	0	.6	75 RA.	2400	.141	30.1	7.2	27	.006
4901H2	26.64	74.2	11.9	13.9	0	0	0	0	50 FOR.	1812	.045	34.1	7.2	27	.270
4901K1	60.93	17.9	9.5	68.5	3.9	0	0	.2	50 RAF.	1010	.045	25.2	6.5	30	.038
DEER CREEK RESERVOIR															
4903B1	4.74	78.6	0	21.4	0	0	0	0	50 FOR.	1010	.045	33.9	6.5	64	.011

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
TEXAS												
MEDINA RESERVOIR												
4822A3	2	0	1.2	1.4	.012	.008	.909	.683	.8	.5	61.3	46.1
4822A4	2	0	1.3	1.4	.010	.005	.765	.486	.7	.3	51.6	32.8
4822B1	2	0	1.0	1.2	.010	.006	1.960	1.766	.7	.4	128.5	115.7
4822C1	2	0	.4	.4	.010	.006	3.444	3.211	.8.	.5	270.2	251.9
PALESTINE RESERVOIR												
4824E1	2	0	10.9	10.8	.036	.015	.678	.233	7.6	3.2	143.7	49.4
4824F1	2	0	3.4	3.4	.050	.018	.968	.414	10.6	3.8	204.4	87.4
SAM RAYBURN RESERVOIR												
4827D1	2	0	4.1	4.6	.054	.011	.630	.210	7.3	1.5	84.7	28.2
4827G1	2	.797	.1	.1	.030	.010	.555	.071	2.8	.9	51.3	6.6
4827H1	2	0	2.3	2.4	.019	.008	.548	.101	1.6	.7	47.1	8.7
4827J1	2	.719	0	0	.015	.008	.545	.071	1.3	.7	46.5	6.1
4827K1	2	.618	0	0	.017	.009	.597	.064	2.2	1.2	78.1	8.4
4827L1	2	.740	0	0	.013	.008	.584	.058	1.1	.7	49.4	4.9
4827P1	2	.725	0	0	.059	.021	.745	.063	10.1	3.6	127.7	10.8
4827Q1	2	.596	0	0	.065	.020	.756	.088	8.7	2.7	101.6	11.8
SOMERVILLE LAKE												
4829F1	2	0	31.4	31.3	.053	.025	1.260	.137	9.7	4.6	231.2	25.1
STILLHOUSE HOLLOW RES.												
4831C1	2	0	6.3	7.3	.023	.006	.543	.166	1.8	.5	41.6	12.7
TEXARKANA RESERVOIR												
4833J1	2	0	13.6	13.8	.109	.045	.920	.236	25.2	10.4	212.9	54.6
TEXOMA LAKE												
4834F1	2	0	6.9	6.9	.030	.014	.958	.084	4.7	2.2	150.8	13.2
4834G1	2	1.391	29.4	29.4	.041	.013	.986	.163	7.1	2.3	171.0	28.3
4834H1	2	0	22.9	22.8	.040	.016	1.714	.280	5.2	2.1	221.8	36.2
TRAVIS LAKE												
4835B1	2	0	0	0	.011	.005	.637	.335	1.4	.6	80.2	42.2
4835D1	2	0	4.8	5.0	.020	.008	1.097	.562	2.0	.8	111.2	57.0
4835E1	2	0	2.6	2.8	.019	.011	.698	.127	1.9	1.1	70.4	12.8
4835F1	2	0	1.4	1.4	.010	.005	.598	.321	.1	.1	6.3	3.4
WHITNEY RESERVOIR												
4839E1	2	0	5.7	5.7	.022	.008	.767	.306	3.5	1.3	121.1	48.3
4839J1	2	0	29.1	29.3	.169	.143	1.213	.539	21.3	18.0	153.0	68.0
UTAH												
BEAR LAKE												
4901C1	0	0	0	0	.321	.030	3.530	1.937	5.2	.5	57.4	31.5
4901H2	0	0	0	0	.033	.021	.788	.121	10.5	6.7	251.9	38.7
4901K1	0	0	.6	.6	.036	.008	.697	.172	.7	.2	13.7	3.4
DEER CREEK RESERVOIR												
4903B1	0	1.438	0	0	.059	.025	.324	.125	4.3	1.8	23.7	9.1

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL[3] LAND USE CATEGORY	GEOLOGY		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	[4] P-COM (%)				
UTAH															
PINEVIEW RESERVOIR															
4916E1	20.44	40.3	24.8	29.5	5.4	0	0	0	MIXED	3414	.030	25.5	6.5	98	.130
UTAH LAKE															
4924Q1	85.92	21.9	72.3	2.1	1.9	0	0	1.8	50 CL.	1213	.030	56.5	6.5	34	.670
VERMONT															
ARROWHEAD MOUNTAIN LAKE															
501021	22.07	37.1	3.0	0	59.1	.8	0	0	50 AG.	1012	.064	7.6	4.5	84	.420
501031	236.21	53.3	9.6	0	32.8	3.0	1.3	0	50 FOR.	3813	.182	16.7	4.5	84	4.490
WATERBURY RESERVOIR															
501131	5.41	79.5	3.0	0	17.5	0	0	0	50 FOR.	3830	.142	18.9	4.5	99	.120
501141	23.05	84.6	.7	0	13.0	1.7	0	0	50 FOR.	3038	.158	23.3	4.5	99	.510
501151	66.59	81.3	3.5	0	13.5	.7	1.0	0	50 FOR.	3038	.158	18.1	4.5	99	1.460
VIRGINIA															
CLAYTOR LAKE															
5103B1	48.02	97.8	.8	0	.6	.2	0	.6	90 FOR.	1110	.060	31.9	4.5	102	.420
5103E1	43.80	3.9	3.0	0	90.8	.4	0	1.9	90 AG.	1210	.056	17.7	4.5	102	.360
JOHN W. FLANNAGAN RES.															
5105D1	20.95	66.7	12.8	0	7.2	1.4	0	11.9	50 FOR.	1111	.055	36.7	5.0	117	.260
5105E1	8.83	83.6	5.1	0	11.3	0	0	0	50 FOR.	1111	.055	34.8	5.0	117	.110
5105F1	7.25	88.3	5.9	0	5.8	0	0	0	75 FOR.	1111	.055	31.5	5.0	117	.090
OCCOQUAN RESERVOIR															
5108D1	13.91	69.5	9.9	0	19.6	.3	0	.7	50 FOR.	3022	.078	9.7	4.5	102	.120
SMITH MOUNTAIN RESERVOIR															
5110E1	27.07	69.8	8.4	0	20.4	.7	0	.7	50 FOR.	2130	.113	24.1	4.5	109	.320
5110F1	68.58	57.6	5.5	0	35.8	.4	0	.7	50 FOR.	2130	.113	20.8	4.5	109	.770
5110G1	11.73	50.2	5.4	0	43.0	1.0	0	.4	50 FOR.	2130	.113	16.4	4.5	109	.140
LAKE CHESDIN															
5111B1	25.87	63.2	3.2	0	32.5	.1	0	1.0	50 FOR.	2050	.115	5.4	4.5	112	.250
5111C1	152.32	70.4	6.4	0	22.1	.1	.4	.6	50 FOR.	3024	.099	5.3	4.5	112	1.480
5111E1	52.97	83.5	6.4	0	8.6	.5	.2	.8	50 FOR.	3024	.114	6.0	4.5	112	.500
CHICKAHOMINY LAKE															
5112B1	4.77	86.0	6.7	0	7.3	0	0	0	50 FOR.	1211	.070	8.2	4.5	112	.060
5112C1	17.53	81.9	2.2	0	15.8	.1	0	0	50 FOR.	1917	.070	6.7	4.5	112	.200
5112D1	14.66	65.6	7.8	0	26.3	0	0	.3	50 FOR.	1917	.070	9.3	4.5	112	.170
WASHINGTON															
BANKS LAKE															
53021F	51.34	0	5.9	3.2	90.3	0	.3	.3	90 AG.	1500	.070	6.2	6.5	35	.036
5302B1	37.39	0	14.6	0	85.4	0	0	0	75 AG.	1526	.157	6.6	6.5	35	.026
5302E1	25.90	0	.9	1.6	97.5	0	0	0	90 AG.	1526	.157	5.8	6.5	35	.018
CHELAN LAKE															
5303D1	15.58	97.5	2.5	0	0	0	0	0	90 FOR.	2223	.115	45.5	5.0	121	.100
5303E1	108.30	85.9	13.9	0	.2	0	0	0	75 FOR.	2135	.129	59.3	5.0	121	1.420
5303F1	22.88	68.1	31.1	0	0	0	0	.8	50 FOR.	2223	.115	51.2	5.0	121	.350
5303G1	92.91	60.5	33.9	0	0	0	0	5.6	50 FOR.	2135	.129	65.6	5.0	121	1.830
5303H1	168.61	59.7	0	0	0	.2	0	40.1	50 FOR.	3521	.129	67.7	5.0	121	7.010

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
UTAH												
PINEVIEW RESERVOIR												
4916E1	0	0	2.5	2.6	.076	.034	.897	.560	15.2	6.8	179.9	112.3
UTAH LAKE												
4924Q1	0	0	.7	.7	.026	.015	.476	.291	6.4	3.7	117.1	71.6
VERMONT												
ARROWHEAD MOUNTAIN LAKE												
501021	1	0	61.8	61.7	.031	.007	1.029	.426	18.6	4.2	617.5	255.7
501031	1	0	35.3	35.2	.036	.007	1.034	.499	21.6	4.2	619.8	299.1
WATERBURY RESERVOIR												
501131	1	0	17.9	17.8	.021	.007	.697	.324	14.7	4.9	487.6	226.6
501141	1	0	13.3	13.2	.013	.005	.745	.373	9.1	3.5	519.8	260.3
501151	1	0	13.8	13.7	.020	.006	.835	.375	13.8	4.1	577.3	259.3
VIRGINIA												
CLAYTOR LAKE												
5103B1	1	1.620	.7	.7	.022	.007	.433	.131	6.1	1.9	119.4	36.1
5103E1	1	1.640	109.3	113.2	.022	.010	1.374	.996	5.7	2.6	356.1	258.2
JOHN W. FLANNAGAN RES.												
5105D1	1	0	3.8	3.8	.023	.008	1.400	.450	9.0	3.1	547.9	176.1
5105E1	1	0	6.0	6.0	.020	.010	.917	.209	7.9	3.9	360.3	82.1
5105F1	1	1.570	3.1	3.1	.022	.009	.842	.152	8.6	3.5	329.6	59.5
OCCOQUAN RESERVOIR												
5108D1	1	0	15.8	15.8	.041	.028	.924	.277	11.2	7.6	251.4	75.4
SMITH MOUNTAIN RESERVOIR												
5110E1	1	0	22.1	22.0	.075	.027	.893	.336	28.0	10.1	332.9	125.3
5110F1	1	0	38.7	38.6	.099	.024	.990	.313	35.1	8.5	350.5	110.8
5110G1	1	0	46.5	46.4	.036	.014	.710	.339	13.5	5.3	267.2	127.6
LAKE CHESDIN												
5111B1	1	0	19.7	19.2	.049	.022	.889	.179	14.9	6.7	270.9	54.6
5111C1	1	0	14.2	14.0	.037	.012	.540	.057	11.3	3.7	165.5	17.5
5111E1	1	0	8.8	8.7	.040	.013	.640	.068	11.9	3.9	190.5	20.2
CHICKAHOMINY LAKE												
5112B1	1	0	2.0	2.0	.064	.035	.660	.049	25.4	13.9	261.8	19.4
5112C1	1	0	4.3	4.2	.076	.039	.730	.126	27.3	14.0	262.7	45.3
5112D1	1	0	9.0	8.7	.115	.064	.727	.101	42.1	23.4	265.9	36.9
WASHINGTON												
BANKS LAKE												
53021F	90	1.460	20.6	20.8	.460	.217	7.937	6.650	10.2	4.8	175.5	147.1
5302B1	0	1.416	19.5	19.7	.259	.101	5.734	4.816	5.7	2.2	125.7	105.6
5302E1	90	1.472	22.3	22.5	1.120	.212	8.019	4.838	24.5	4.6	175.8	106.0
CHELAN LAKE												
5303D1	0	1.063	0	0	.020	.015	.248	.085	4.0	3.0	50.2	17.2
5303E1	0	.882	0	0	.014	.011	.276	.100	5.8	4.5	114.1	41.3
5303F1	0	0	0	0	.020	.008	.130	.054	9.6	3.9	62.7	26.1
5303G1	0	0	0	0	.011	.006	.360	.049	6.8	3.7	223.6	30.4
5303H1	0	0	0	0	.011	.006	.553	.118	14.4	7.9	725.0	154.7

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL LAND USE CATEGORY[3]	GEOLOGY[4]		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	P-COM (%)				
WASHINGTON															
KEECHELUS LAKE															
53061F	105.70	64.7	34.2	0	0	0	.8	.3	50 FOR.	2626	.184	42.1	5.0	258	7.820
53061G	15.64	67.2	32.8	0	0	0	0	0	50 FOR.	2626	.184	42.0	5.0	258	1.100
53061H	34.65	68.1	31.9	0	0	0	0	0	50 FOR.	2626	.184	38.9	5.0	258	3.030
53061J	12.77	63.7	36.3	0	0	0	0	0	50 FOR.	2626	.184	42.7	5.0	258	.830
53061K	57.67	74.7	25.0	0	0	0	0	.3	50 FOR.	2626	.184	42.1	5.0	258	3.920
53061L	11.92	65.6	34.1	0	0	0	0	.3	50 FOR.	2626	.184	42.2	5.0	258	.770
53061M	91.01	80.9	18.9	0	0	0	0	.2	75 FOR.	2626	.184	41.2	5.0	258	6.550
5306B1	20.86	67.0	31.6	0	0	0	0	1.4	50 FOR.	2626	.184	39.6	5.0	185	1.470
5306D1	10.44	80.0	17.1	0	0	0	0	2.9	75 FOR.	2626	.184	54.9	5.0	185	.750
5306E1	34.59	48.5	49.5	0	0	0	0	2.0	MIXED	1124	.133	59.8	5.0	185	2.610
MAYFIELD LAKE															
5307B1	27.80	45.1	6.8	.8	44.3	3.0	0	0	MIXED	1024	.136	12.3	5.0	144	.663
5307C1	5.60	61.1	17.9	0	21.0	0	0	0	50 FOR.	1526	.146	10.4	5.0	144	.134
OZETTE LAKE															
53101F	15.09	45.7	54.3	0	0	0	0	0	50 CL.	1100	.040	12.5	5.5	263	3.420
5310B1	26.24	64.5	33.8	0	0	0	0	1.7	50 FOR.	1100	.040	15.7	5.5	263	6.230
5310C1	58.76	52.8	45.3	0	1.9	0	0	0	50 FOR.	1126	.157	10.6	5.5	263	14.650
5310D1	20.50	83.7	15.2	0	0	0	1.1	0	75 FOR.	1100	.040	20.6	5.5	263	4.880
5310E1	12.90	44.1	55.7	0	.2	0	0	0	50 CL.	1100	.040	6.2	5.5	263	3.210
SAMMAMISH LAKE															
5311E1	13.00	89.0	.6	0	7.1	2.6	0	.7	50 FOR.	1500	0	22.4	4.5	89	.253
WHATCOM LAKE															
5312B1	9.78	91.8	8.2	0	0	0	0	0	90 FOR.	1100	.040	29.3	4.5	91	.301
5312C1	19.96	91.4	.2	0	.2	8.2	0	0	50 FOR.	1100	.040	30.2	4.5	91	.580
WEST VIRGINIA															
BLUESTONE RESERVOIR															
5401E1	45.95	66.2	1.9	0	31.9	0	0	0	50 FOR.	1000	.056	29.9	4.5	97	.730
5401F1	31.83	61.1	3.2	0	35.7	0	0	0	50 FOR.	1000	.056	28.1	4.5	97	.490
LAKE LYNN															
5402C1	6.03	72.0	1.1	0	23.4	3.4	0	.1	50 FOR.	1000	.049	15.8	5.5	112	.140
TYGART RESERVOIR															
5404C1	1.50	52.2	0	0	47.0	0	0	.8	50 FOR.	1000	.049	19.4	5.5	117	.040
5404D1	9.04	26.9	2.9	0	62.3	7.8	0	.1	50 AG.	1000	.049	13.6	5.5	117	.200
5404H1	23.23	48.4	5.8	0	38.9	0	1.9	5.0	MIXED	1000	.049	23.1	5.5	117	.510
WISCONSIN															
BUTTERNUT LAKE															
5509A3	57.73	46.7	7.4	0	8.0	0	37.2	.7	MIXED	2000	.118	3.5	4.4	84	.690
5509B1	20.54	35.3	10.2	0	22.7	0	31.8	0	MIXED	2000	.118	4.0	4.5	84	.240
EAU CLAIRE LAKE															
5515C1	76.12	59.1	6.5	0	32.1	0	2.3	0	50 FOR.	1300	.040	3.0	6.3	79	.590

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM) TOT P	TOT N	MEAN CONCENTRATIONS (MG/L) TOT P	ORTHO P	TOT N	INORG N	EXPORT (KG/SQ KM) TOT P	ORTHO P	TOT N	INORG N
WASHINGTON												
KEECHELUS LAKE												
53061F	0	0	0	0	.008	.005	.228	.095	18.7	11.7	532.0	221.6
53061G	0	0	0	0	.008	.006	.227	.032	17.7	13.3	503.5	71.0
53061H	0	0	0	0	.010	.008	.323	.057	27.6	22.1	890.7	157.2
53061J	0	0	0	0	.011	.006	.319	.085	22.5	12.3	653.9	174.2
53061K	0	0	0	0	.010	.005	.328	.043	21.4	10.7	703.1	92.2
53061L	0	0	0	0	.022	.019	.225	.041	44.8	38.7	458.4	83.5
53061M	0	.922	0	0	.010	.009	.116	.025	22.7	20.4	263.3	56.7
5306B1	0	0	0	0	.008	.008	.159	.072	17.8	17.8	353.4	160.0
5306D1	0	1.219	0	0	.007	.006	.265	.049	15.9	13.6	600.4	111.0
5306E1	0	0	0	0	.007	.006	.196	.077	16.7	14.3	466.4	183.2
MAYFIELD LAKE												
5307B1	0	0	29.0	29.1	.053	.027	1.448	.915	39.9	20.3	1089.0	688.2
5307C1	0	0	13.7	13.8	.032	.014	.892	.533	24.2	10.6	675.1	403.4
OZETTE LAKE												
53101F	0	0	1.8	1.8	.034	.014	.449	.141	243.0	100.1	3209.1	1007.8
5310B1	0	0	0	0	.015	.007	.236	.063	112.3	52.4	1767.0	471.7
5310C1	0	0	0	0	.022	.012	.433	.119	173.0	94.4	3404.5	935.6
5310D1	0	.748	.2	.2	.015	.007	.282	.070	112.6	52.5	2117.0	525.5
5310E1	0	0	0	0	.041	.015	.454	.090	321.7	117.7	3562.7	706.3
SAMMAMISH LAKE												
5311E1	0	0	10.1	10.3	.023	.010	1.907	1.477	14.1	6.1	1170.4	906.5
WHATCOM LAKE												
5312B1	0	1.363	0	0	.019	.007	.787	.601	18.4	6.8	763.9	583.3
5312C1	0	0	.3	.3	.022	.007	.838	.633	20.2	6.4	767.9	580.1
WEST VIRGINIA												
BLUESTONE RESERVOIR												
5401E1	1	0	27.7	28.0	.019	.007	.589	.291	9.5	3.5	295.1	145.8
5401F1	1	0	30.2	30.3	.015	.006	.810	.389	7.3	2.9	393.2	188.8
LAKE LYNN												
5402C1	1	0	18.4	19.0	.012	.006	1.186	.868	8.8	4.4	868.4	635.5
TYGART RESERVOIR												
5404C1	1	0	43.9	44.5	.056	.020	1.003	.557	47.1	16.8	843.5	468.4
5404D1	1	0	58.2	59.0	.077	.019	1.241	.593	53.7	13.3	865.8	413.7
5404H1	1	0	27.3	27.5	.027	.006	.774	.301	18.7	4.2	535.9	208.4
WISCONSIN												
BUTTERNUT LAKE												
5509A3	1	0	5.5	5.5	.033	.015	.928	.203	12.4	5.7	349.8	76.5
5509B1	1	0	15.6	15.6	.041	.018	1.282	.274	15.1	6.6	472.4	101.0
EAU CLAIRE LAKE												
5515C1	1	0	26.4	26.5	.068	.029	1.650	.282	16.6	7.1	403.3	68.9

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS [1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES [2] FOR	CL	RA	AG	URB	WET	OTHER	OVERALL LAND USE CATEGORY [3]	GEOLOGY ORIGIN	GEOLOGY [4] P-COM (%)	MEAN SLOPE (%)	PH [5]	AVE ANN PRECIP. (CM)	FLOW [6] (CM/SQ KM)
WISCONSIN															
KEGONSA LAKE															
5520C1	15.05	6.3	7.2	0	80.3	0	6.0	.2	75 AG.	1213	.030	4.5	6.3	81	.060
5520D1	6.55	8.5	2.3	0	88.7	0	0	.5	75 AG.	1200	.020	5.7	6.3	81	.030
SHAWANO LAKE															
5539C1	38.85	9.4	.8	0	72.5	.2	14.0	3.1	50 AG.	1213	.030	2.0	4.5	76	.280
TAINTER LAKE															
5546B1	45.92	36.3	2.8	0	49.5	0	10.9	.5	MIXED	1300	.040	8.8	6.3	74	.250
WAPOGASSET LAKE															
5550C1	8.91	16.5	6.0	0	55.0	0	22.5	0	50 AG.	1300	.040	3.7	6.3	71	.050
WAUSAU LAKE															
5551C3	34.19	20.5	4.6	0	72.4	2.1	0	.4	50 AG.	2133	.128	2.6	6.3	81	.280
LAKE WINNEBAGO															
5554B1	44.34	7.5	2.6	0	83.7	5.0	1.2	0	75 AG.	1214	.050	4.7	6.3	76	.170
5554C1	51.02	5.4	3.4	0	82.9	6.1	1.1	1.1	75 AG.	1214	.050	3.4	6.3	76	.200
WISCONSIN LAKE															
5555D2	25.72	9.7	.9	0	88.4	1.0	0	0	75 AG.	1312	.030	5.1	6.5	76	.200
5555E2	87.31	15.0	1.4	0	78.4	1.7	3.5	0	75 AG.	1312	.030	7.8	6.3	76	.660
LAKE WISSOTA															
5556D1	143.20	37.7	4.5	0	56.1	0	1.7	0	50 AG.	1300	.040	3.4	6.3	79	1.000
BIG EAU PLEINE RES.															
5565B1	83.09	31.8	4.4	0	63.0	.6	0	.2	50 AG.	2133	.128	2.8	6.3	79	.610
5565C1	59.34	34.7	4.7	0	58.2	0	0	2.4	50 AG.	2133	.128	4.0	6.3	79	.430
BEAVERDAM LAKE															
5577C2	60.97	10.0	6.1	0	71.7	0	12.2	0	50 AG.	1213	.027	2.8	6.3	76	.390
5577E2	4.30	0	0	0	99.1	.9	0	0	90 AG.	1200	.020	1.4	6.3	76	.030
WYOMING															
BOULDER LAKE															
5602B1	3.27	44.1	45.4	9.4	.4	0	.4	.3	MIXED	2200	.087	24.6	5.5	26	.046
BOYSEN RESERVOIR															
5603L1	33.88	12.5	83.5	2.8	0	0	0	1.2	75 CL.	1222	.054	29.6	8.5	35	.025
FLAMING GORGE RESERVOIR															
5605B1	58.30	84.3	.3	14.8	0	.4	0	.2	75 FOR.	3413	.040	16.4	7.2	35	.402
5605D1	123.36	18.7	45.0	36.3	0	0	0	0	MIXED	1410	.065	21.2	6.5	35	.076
5605K1	73.44	31.0	44.4	24.6	0	0	0	0	MIXED	1410	.065	20.6	8.5	35	.059
FREMONT LAKE															
5606B1	5.46	74.3	25.7	0	0	0	0	0	50 FOR.	1500	0	26.8	8.5	26	.076
KEY HOLE RESERVOIR															
5608C1	119.51	0	1.5	87.3	9.0	0	.5	1.7	75 RA.	1411	.070	3.5	7.7	30	.021
5608D1	36.21	17.7	25.8	14.0	27.2	0	0	15.3	MIXED	1111	.060	9.4	7.7	30	.072
SEMINOE RESERVOIR															
5610D1	47.13	6.2	59.4	32.9	1.5	0	0	0	50 CL.	1122	.078	22.8	8.5	40	.160
5610E1	68.61	18.5	66.5	13.0	2.0	0	0	0	50 CL.	2210	.078	26.1	8.5	40	.359

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	TAG[7]	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
WISCONSIN												
KEGONSA LAKE												
5520C1	1	.630	81.6	80.8	.235	.097	3.704	1.973	29.5	12.2	465.7	248.1
5520D1	1	1.200	90.2	89.2	.184	.092	3.378	2.563	26.6	13.3	487.9	370.2
SHAWANO LAKE												
5539C1	1	0	70.5	70.3	.050	.017	1.426	.194	11.4	3.9	324.1	44.1
TAINTER LAKE												
5546B1	1	0	43.5	43.4	.107	.058	1.454	.225	18.4	10.0	249.6	38.6
WAPOGASSET LAKE												
5550C1	1	0	58.9	57.0	.111	.047	1.783	.684	19.6	8.3	315.5	121.0
WAUSAU LAKE												
5551C3	1	0	73.3	73.1	.125	.071	1.949	.999	32.3	18.3	503.4	258.0
LAKE WINNEBAGO												
5554B1	1	.800	13.4	13.1	.195	.102	3.645	2.301	23.6	12.3	440.7	278.2
5554C1	1	.958	13.2	13.0	.179	.098	3.150	1.737	22.1	12.1	389.4	214.7
WISCONSIN LAKE												
5555D2	1	.953	82.9	82.9	.059	.030	2.259	2.084	14.5	7.4	554.0	511.0
5555E2	1	.568	77.9	77.3	.131	.056	2.444	1.726	31.2	13.3	582.6	411.5
LAKE WISSOTA												
5556D1	1	0	52.5	52.4	.085	.050	1.872	.921	18.7	11.0	412.3	202.8
BIG EAU PLEINE RES.												
5565B1	1	0	63.8	63.6	.102	.048	1.866	.700	23.6	11.1	432.0	162.1
5565C1	1	0	58.9	58.8	.066	.036	2.453	1.352	15.1	8.2	560.6	309.0
BEAVERDAM LAKE												
5577C2	1	0	67.5	67.5	.224	.089	2.723	.735	45.2	18.0	549.3	148.3
5577E2	1	.128	100.0	99.1	.136	.094	7.449	6.510	29.9	20.7	1638.9	1432.3
WYOMING												
BOULDER LAKE												
5602B1	0	0	.1	.1	.063	.037	1.108	.089	27.9	16.4	491.5	39.5
BOYSEN RESERVOIR												
5603L1	90	0	0	0	.037	.005	1.611	.092	.9	.1	37.5	2.1
FLAMING GORGE RESERVOIR												
5605B1	0	.798	0	0	.023	.006	.602	.043	5.0	1.3	130.9	9.4
5605D1	0	0	0	0	.092	.035	1.590	.594	1.8	.7	30.9	11.5
5605K1	0	0	0	0	.081	.018	1.528	.373	2.1	.5	38.7	9.5
FREMONT LAKE												
5606B1	0	0	0	0	.011	.007	.588	.037	4.8	3.1	258.1	16.2
KEY HOLE RESERVOIR												
5608C1	0	0	.9	1.0	.358	.059	1.892	.365	2.0	.3	10.5	2.0
5608D1	0	0	2.9	3.1	.284	.140	1.736	.147	17.8	8.8	108.9	9.2
SEMINOE RESERVOIR												
5610D1	0	0	.2	.2	.094	.032	1.236	.177	10.1	3.4	132.3	18.9
5610E1	0	0	.2	.3	.063	.018	.939	.091	10.4	3.0	154.9	15.0

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS[1] STORET NO.	AREA (SQ KM)	LAND USE PERCENTAGES[2]							OVERALL LAND USE CATEGORY[3]	GEOLOGY[4]		MEAN SLOPE (%)	PH[5]	AVE ANN PRECIP. (CM)	FLOW[6] (CM/SQ KM)
		FOR	CL	RA	AG	URB	WET	OTHER		ORIGIN	P-COM (%)				
WYOMING															
VIVA NAUGHTON RESERVOIR 5612B1	13.08	21.1	0	70.1	0	0	0	8.8	50 RAF.	1110	.070	26.3	7.2	24	.055
YELLOWTAIL RESERVOIR 561401	195.82	16.1	40.8	43.0	.1	0	0	0	MIXED	1117	0	24.6	5.5	55	.300

SUMMARY OF LAND USE PARAMETERS BY SUBDRAINAGE AREAS

SUBDRAINAGE AREAS STORET NO.	7 TAG	DRAINAGE DENSITY (KM/SQ KM)	ANIMAL DENSITY (AN UNITS/SQ KM)		MEAN CONCENTRATIONS (MG/L)				EXPORT (KG/SQ KM)			
			TOT P	TOT N	TOT P	ORTHO P	TOT N	INORG N	TOT P	ORTHO P	TOT N	INORG N
WYOMING												
VIVA NAUGHTON RESERVOIR 561281	0	0	0	0	.085	.044	1.699	.725	11.3	5.8	225.3	96.1
YELLOWTAIL RESERVOIR 5614D1	90	0	0	0	.035	.007	1.296	.329	1.7	.3	62.6	15.9

XXXXXXXXXXXX FOOTNOTES XXXXXXXXXXXX

1. LAKE NAMES ARE INCLUDED ONLY TO IDENTIFY THE APPROXIMATE LOCATION OF STREAM SAMPLING SITES. ABOUT 90 PERCENT OF THE SITES LIE WITHIN THE LAKE'S WATERSHED UNDERWHICH THEY ARE LISTED.

2. CL . . . CLEARED UNPRODUCTIVE.

3. OVERALL LAND USE CATEGORY

90 FOR . . . ≥ 90% FOREST
75 FOR . . . ≥ 75% FOREST
50 FOR . . . ≥ 50% FOREST
90 AG . . . ≥ 90% AGRICULTURE
75 AG . . . ≥ 75% AGRICULTURE
50 AG . . . ≥ 50% AGRICULTURE
75 RA . . . ≥ 75% RANGE
50 RAA . . . MOSTLY RANGE; REMAINDER PREDOMINANTLY AGRICULTURE
50 RAF . . . MOSTLY RANGE; REMAINDER PREDOMINANTLY FOREST
75 CL . . . ≥ 75% CLEARED UNPRODUCTIVE
50 CL . . . ≥ 50% CLEARED UNPRODUCTIVE
URBAN . . . URBAN
MIXED . . . MIXED

NOTE -- SEE CATEGORY DEFINITIONS SUBSECTION OF TEXT FOR SPECIFIC DEFINITIONS.

4. GEOLOGY-ORIGIN

10 ..... SEDIMENTARY-MIXED
11 ..... SEDIMENTARY-MIXED, WITHOUT LIMESTONE
12 ..... SEDIMENTARY-LIMESTONE
13 ..... SEDIMENTARY-SANDSTONE
14 ..... SEDIMENTARY-SHALE
15 ..... SEDIMENTARY-UNDIFFERENTIATED
16 ..... SEDIMENTARY-CLAY
17 ..... SEDIMENTARY-GLAUCONITE OR PHOSPHATE ROCK PRESENT
18 ..... SEDIMENTARY-MARINE SEDIMENTS
20 ..... IGNEOUS-MIXED
21 ..... IGNEOUS-PLUTONIC
22 ..... IGNEOUS-PLUTONIC-ACIDIC
23 ..... IGNEOUS-PLUTONIC-BASIC
24 ..... IGNEOUS-VOLCANIC
25 ..... IGNEOUS-VOLCANIC-ACIDIC
26 ..... IGNEOUS-VOLCANIC-BASIC
30 ..... METAMORPHIC-MIXED
31 ..... METAMORPHIC-DERIVED FROM SEDIMENTARY MIXED
32 ..... METAMORPHIC-DERIVED FROM SEDIMENTARY MIXED WITHOUT LIMESTONE
33 ..... METAMORPHIC-DERIVED FROM IGNEOUS
34 ..... METAMORPHIC-DERIVED FROM IGNEOUS PLUTONIC
35 ..... METAMORPHIC-DERIVED FROM IGNEOUS PLUTONIC-BASIC
36 ..... METAMORPHIC-DERIVED FROM IGNEOUS PLUTONIC-ACIDIC
37 ..... METAMORPHIC-DERIVED FROM IGNEOUS VOLCANIC
38 ..... METAMORPHIC-DERIVED FROM IGNEOUS VOLCANIC-BASIC
39 ..... METAMORPHIC-DERIVED FROM IGNEOUS VOLCANIC-ACIDIC
40 ..... MIXED

NOTE -- WHERE COMBINATIONS EXIST THE PREDOMINANT TYPE IS SHOWN FIRST.

5. FROM UNPUBLISHED ESTIMATES BY GUY D. SMITH (1975).

6. CMS/SQ KM ..... CUBIC METERS/SECOND/SQUARE KILOMETER.

7. TAG

   1 ..... EASTERN REGION
   2 ..... CENTRAL REGION
   0 ..... WESTERN REGION
   9 ..... DATA USED ONLY FOR EXPORT RELATIONSHIPS

A

Figure 29.

GEOLOGIC CLASSIFICATION AND MEAN ANNUAL STREAM PHOSP CONCENTRATIONS AND EXPORTS FROM A NATIONWIDE SET OF 586 NONPOINT SOURCE WATERSHEDS. DATA GROUPED BY OVERALL LAND USE CATEGORY.

GEOLOGIC CLASSIFICATION AND GROUPING

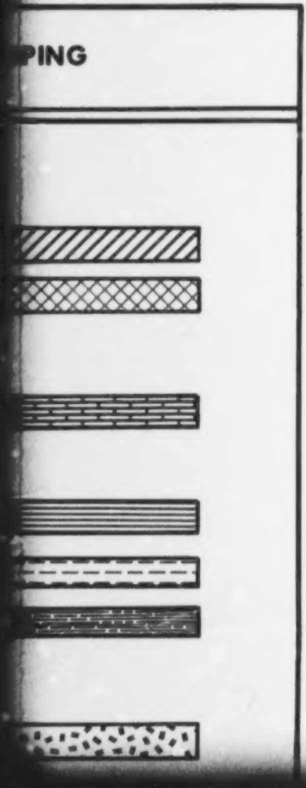
SEDIMENTARY	
Sedimentary only	▨
Predominantly sedimentary	▩
Sedimentary; some or all limestone	▤
Sedimentary; without limestone	▤
Sedimentary; sandstone	▤
Sedimentary; shale	▤
IGNEOUS	
Igneous only	▒

AL STREAM PHOSPHORUS

M A NATIONWIDE

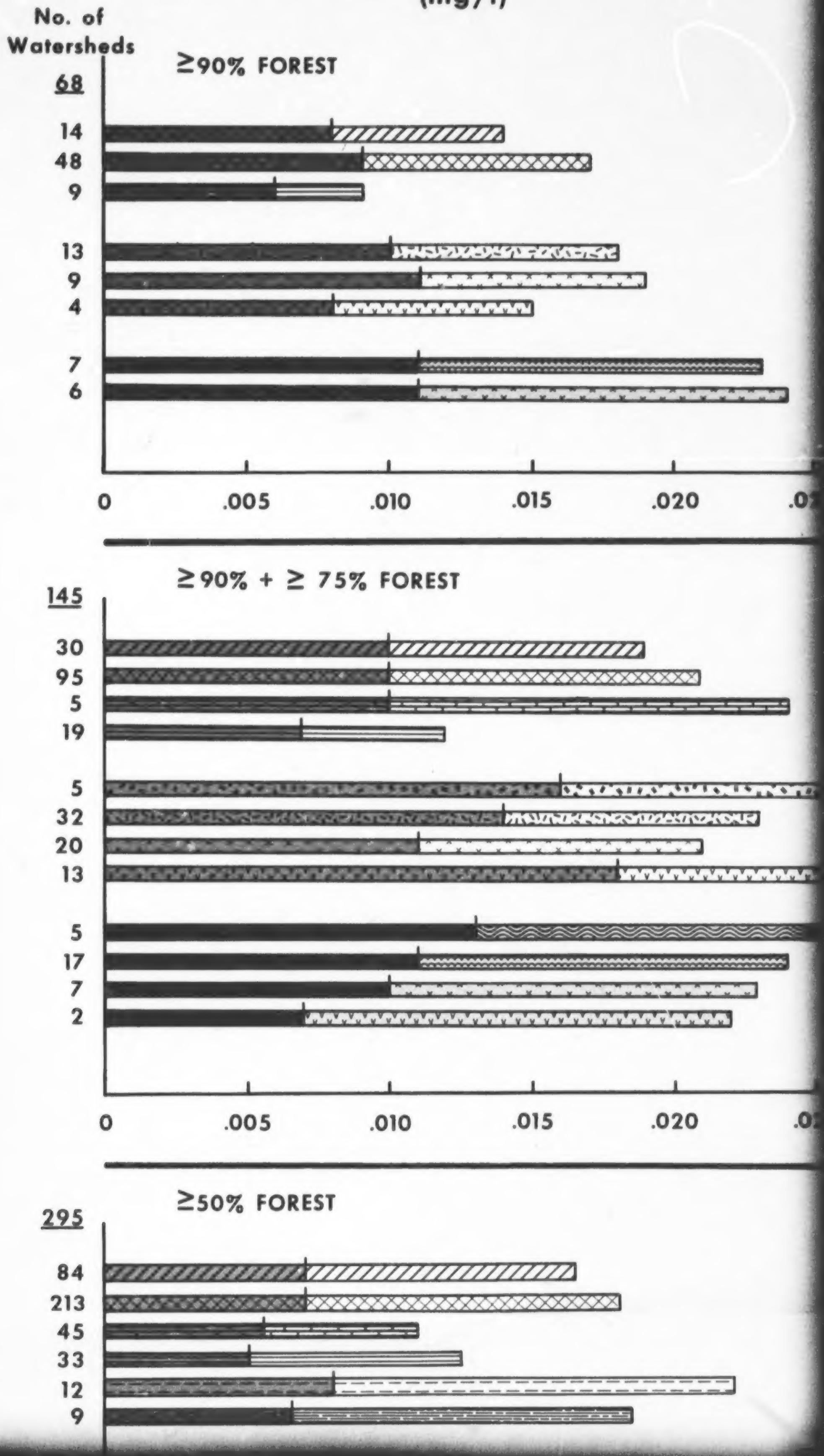
VATERSHEDS.

USE CATEGORY.



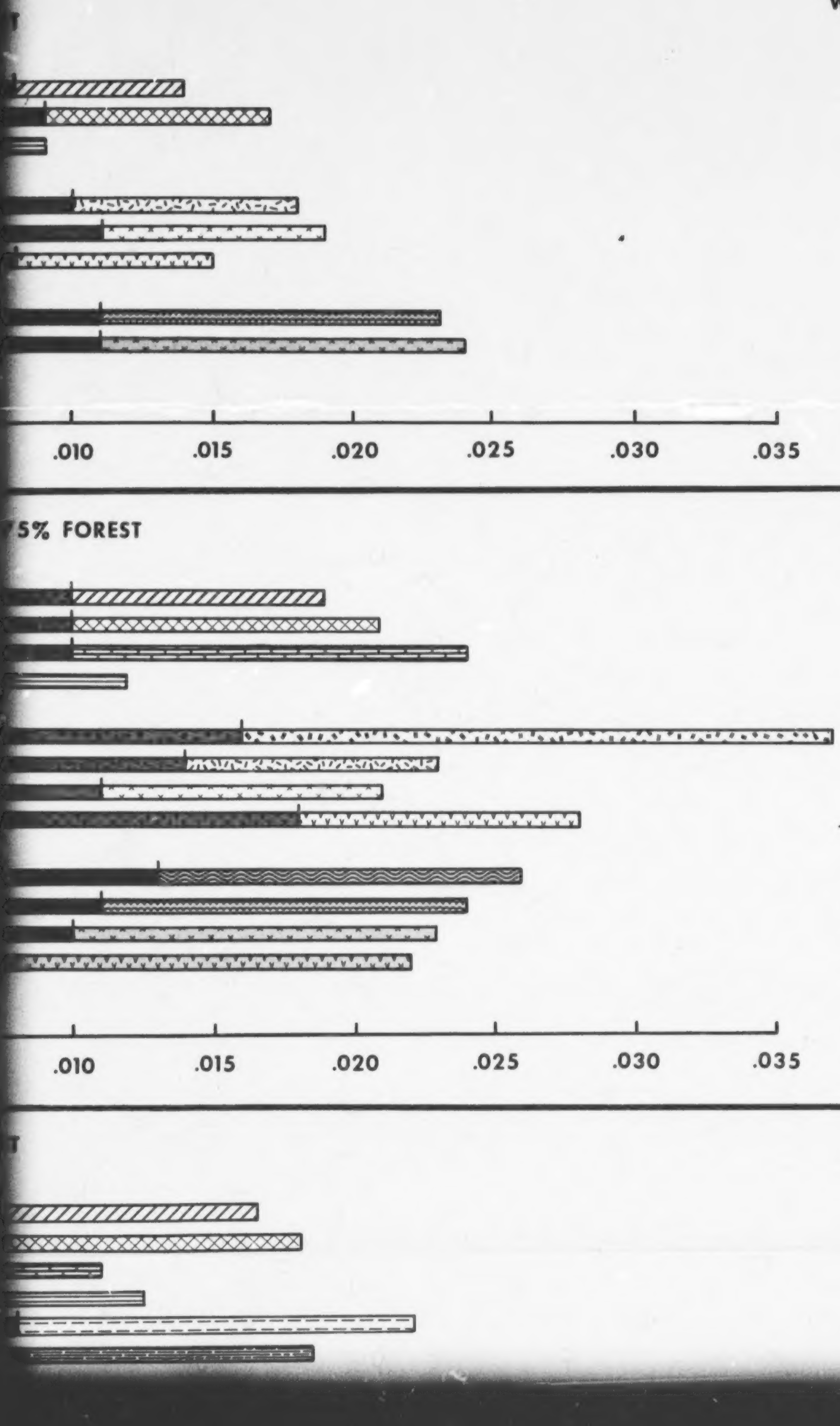
B

MEAN TOTAL PHOSPHORUS AND MEAN ORTHOPHOSPHORUS CONCENTRATIONS (mg/l)

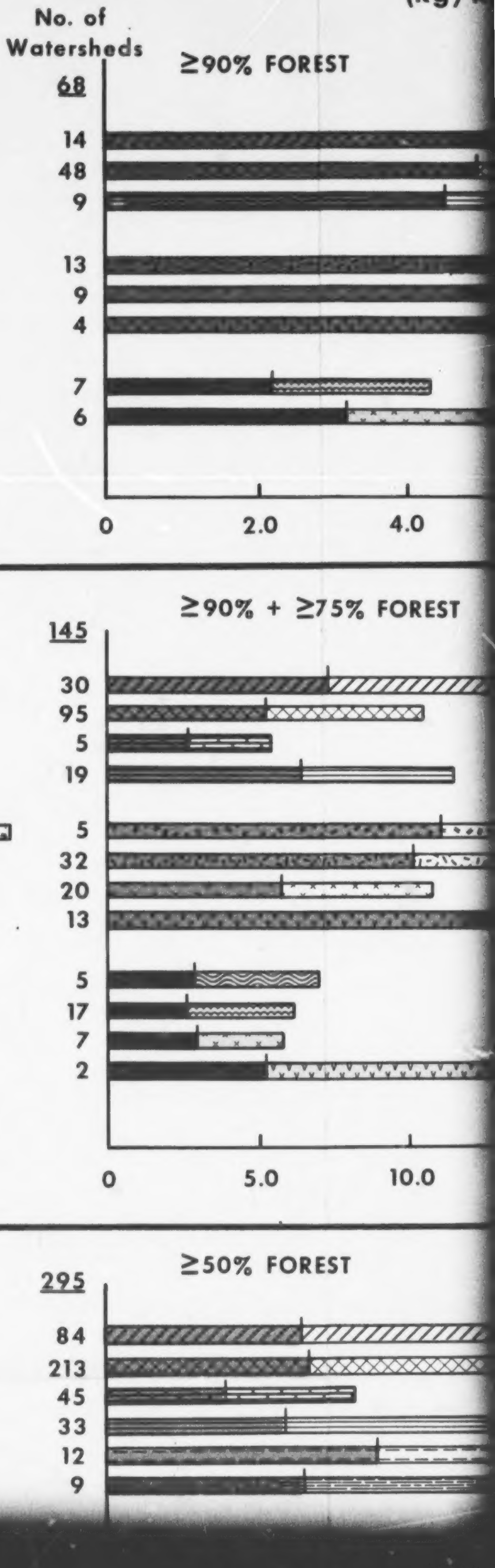


TAL PHOSPHORUS AND MEAN
OSPHORUS CONCENTRATIONS
(mg/l)

C

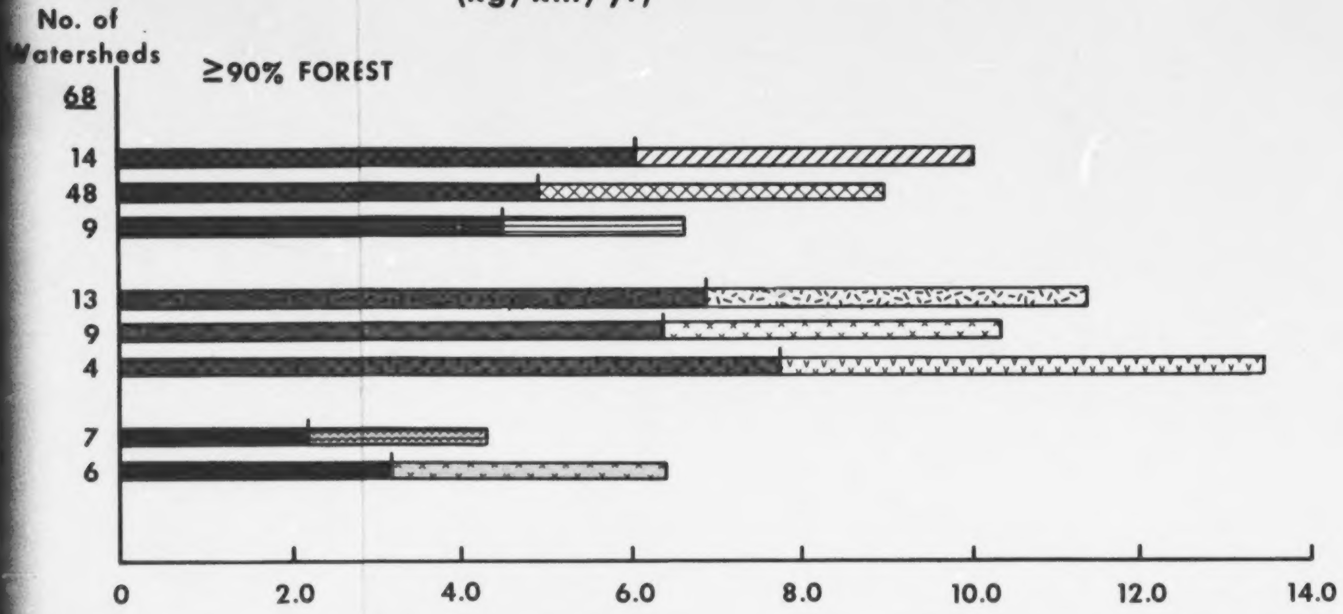


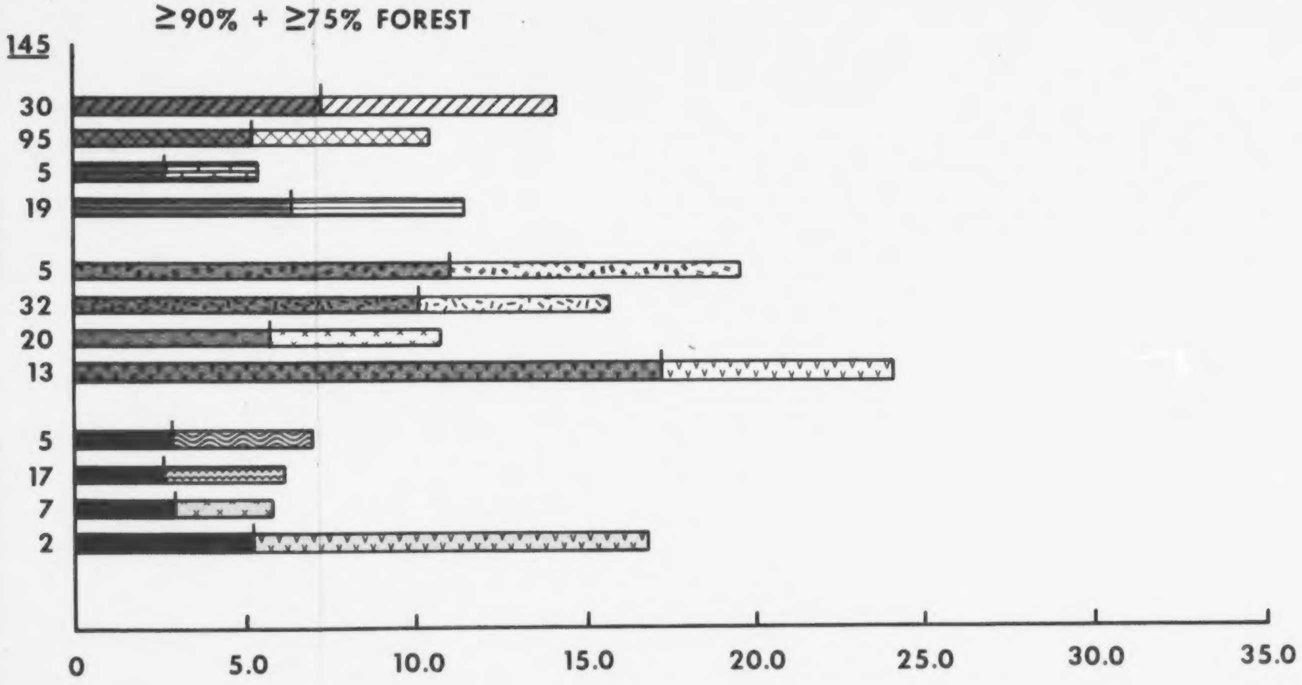
MEAN TOTAL PHOS
ORTHOPHOSPHORU
(kg/k

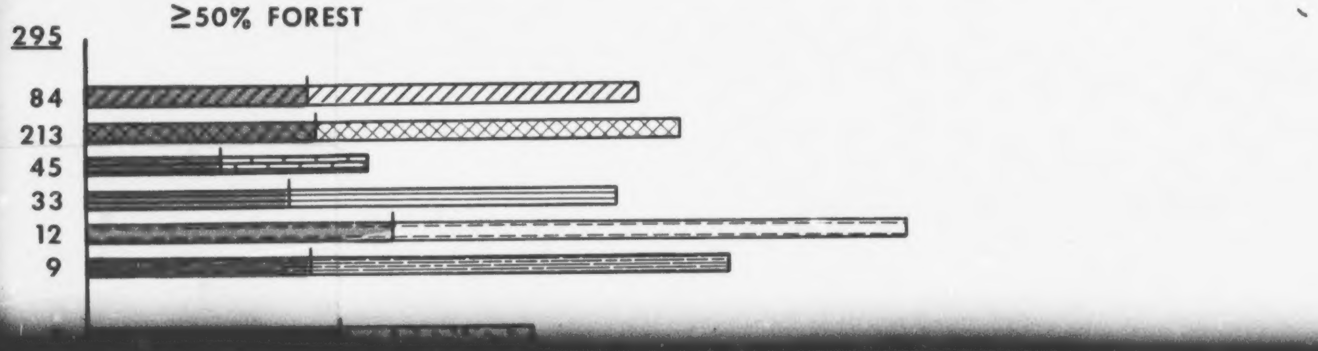


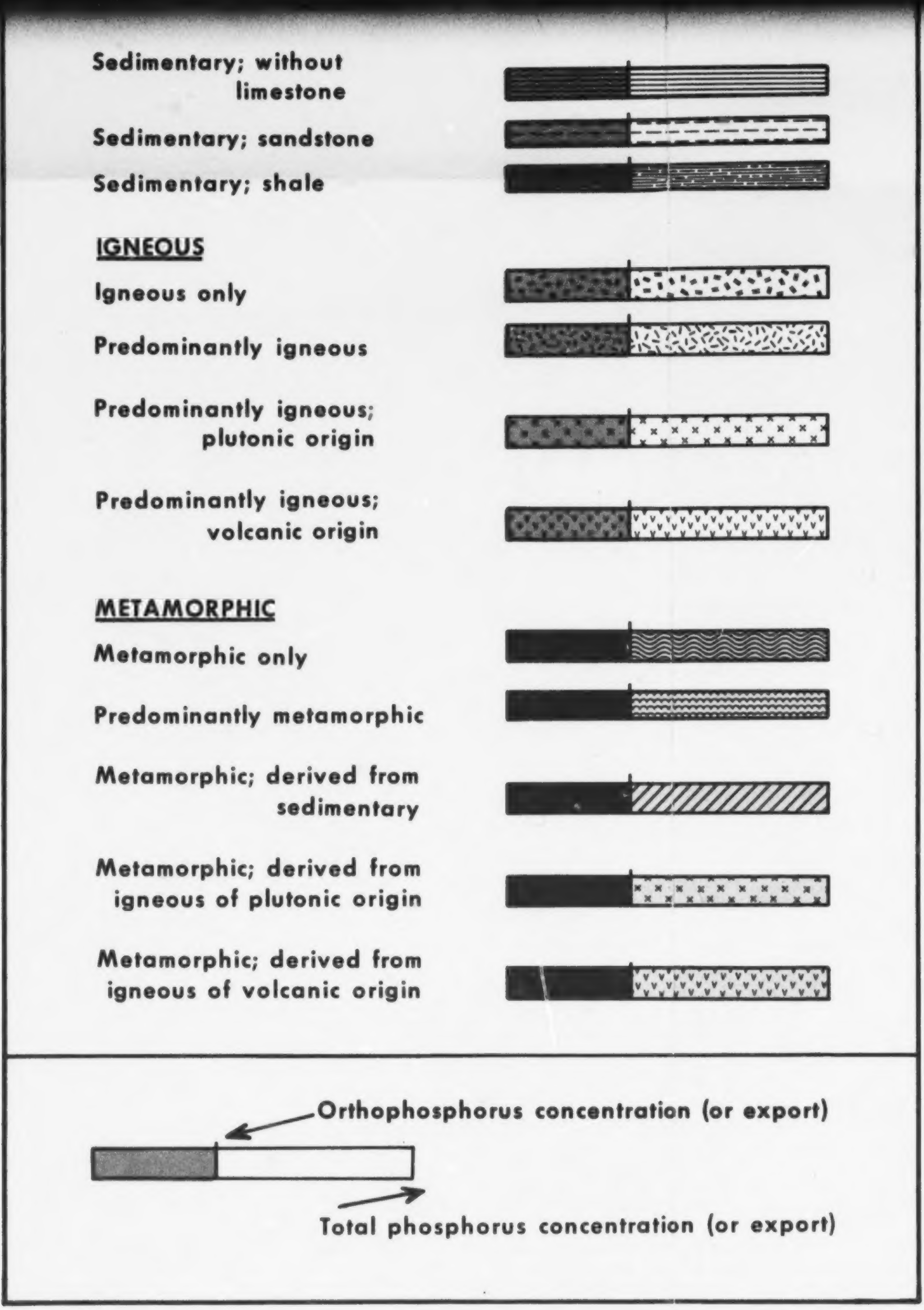
MEAN TOTAL PHOSPHORUS AND MEAN ORTHOPHOSPHORUS EXPORTS (kg/km/yr)

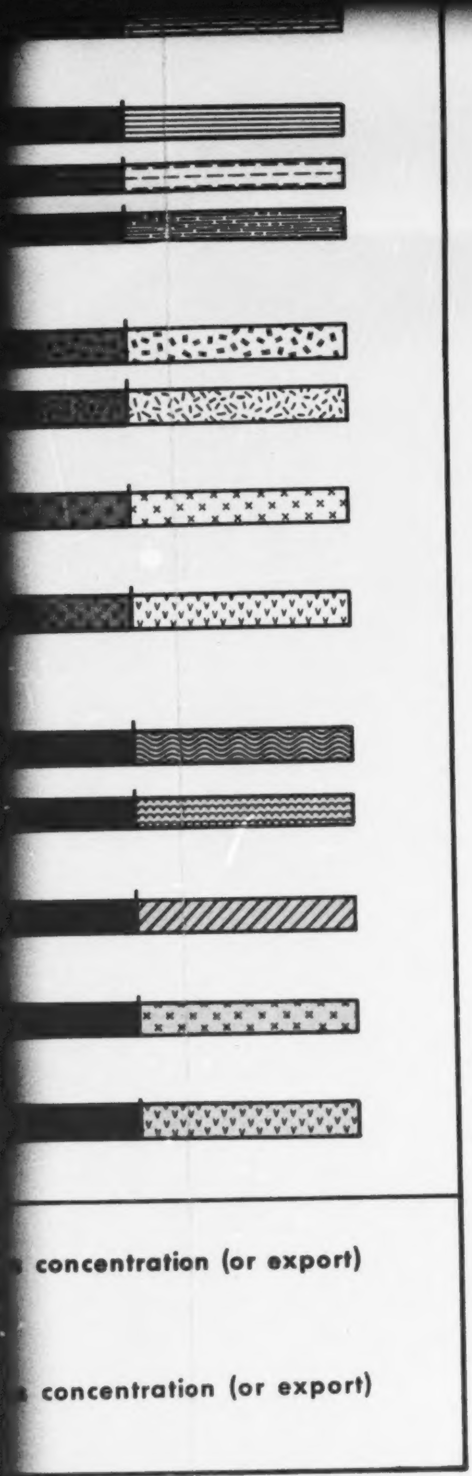
D



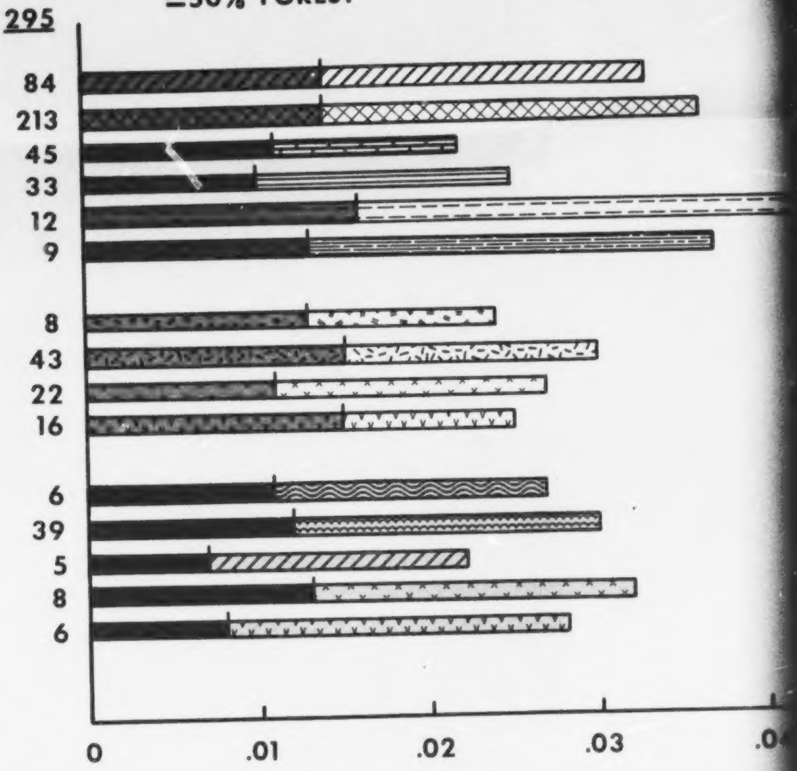




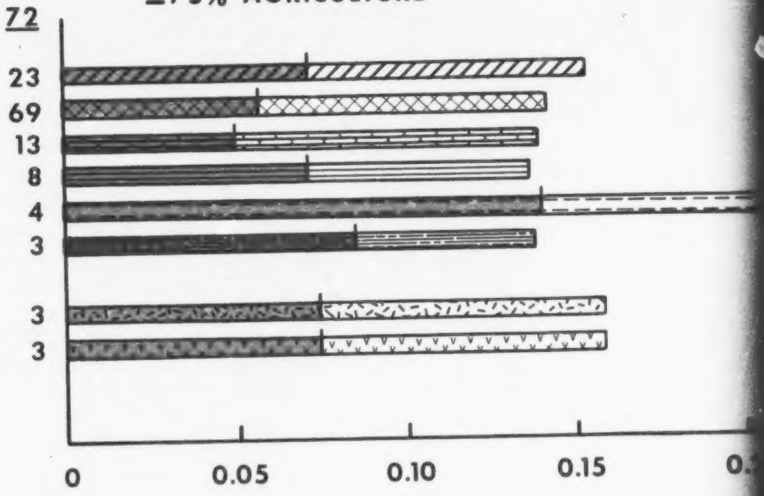

Sedimentary; without limestone
Sedimentary; sandstone
Sedimentary; shale
IGNEOUS
Igneous only
Predominantly igneous
Predominantly igneous; plutonic origin
Predominantly igneous; volcanic origin
METAMORPHIC
Metamorphic only
Predominantly metamorphic
Metamorphic; derived from sedimentary
Metamorphic; derived from igneous of plutonic origin
Metamorphic; derived from igneous of volcanic origin
Orthophosphorus concentration (or export)
Total phosphorus concentration (or export)



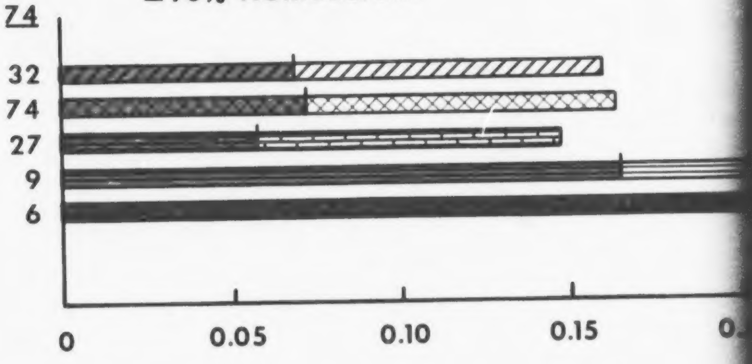
≥50% FOREST



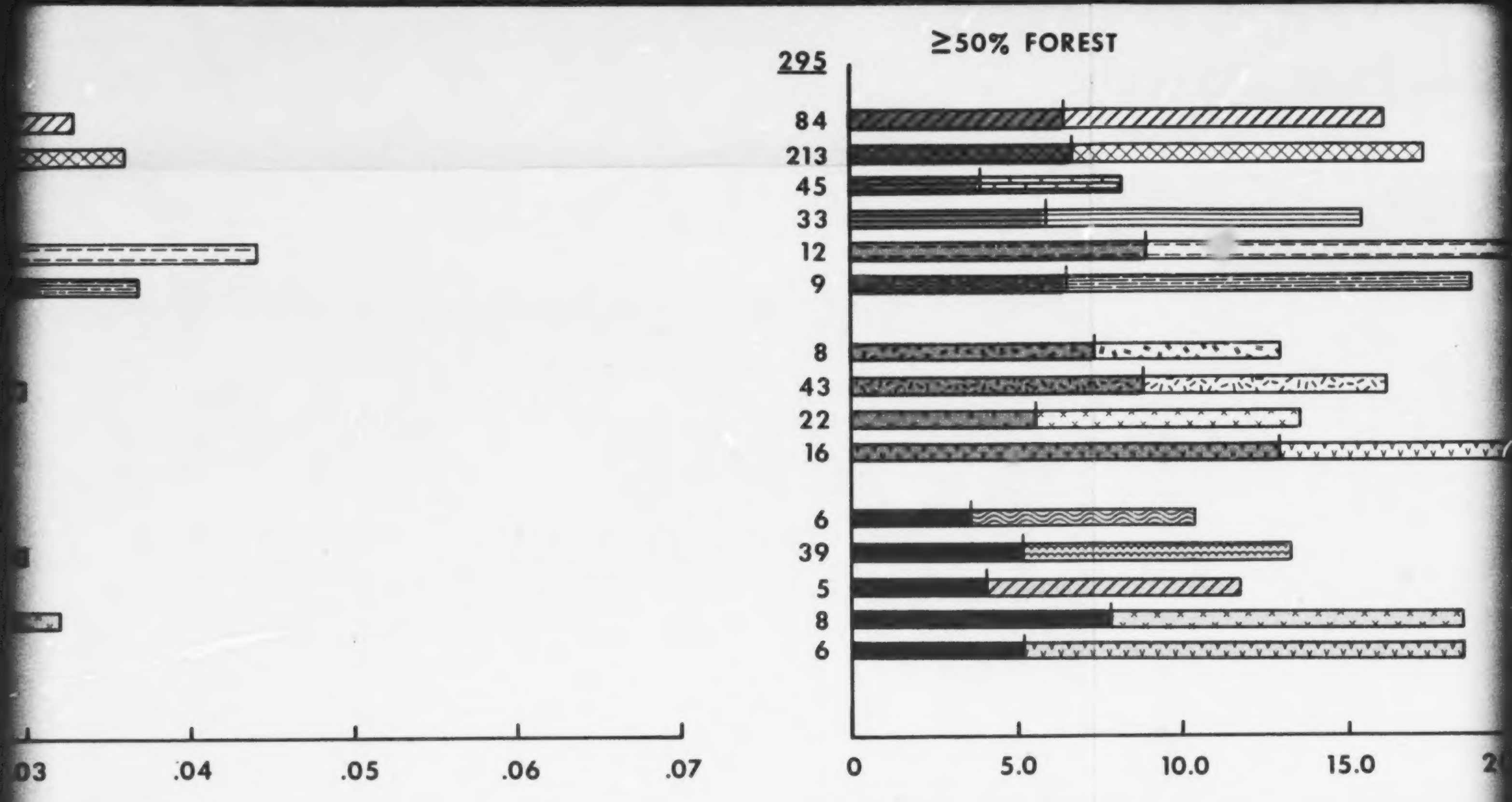
≥75% AGRICULTURE

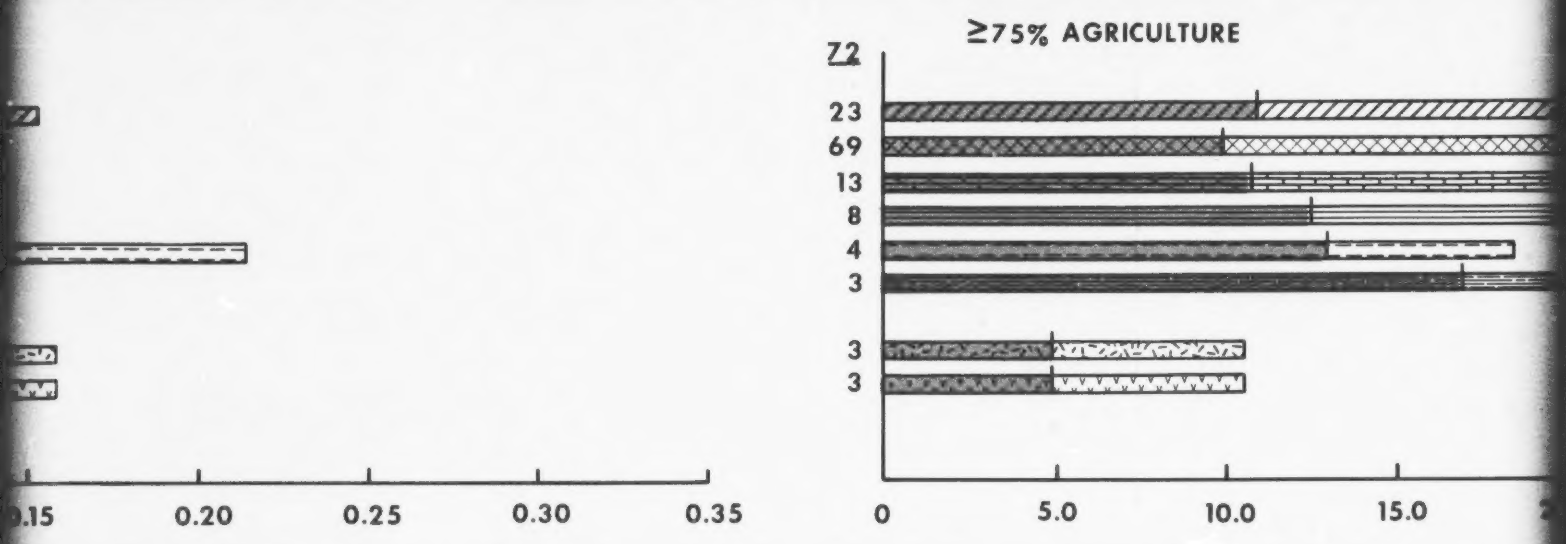


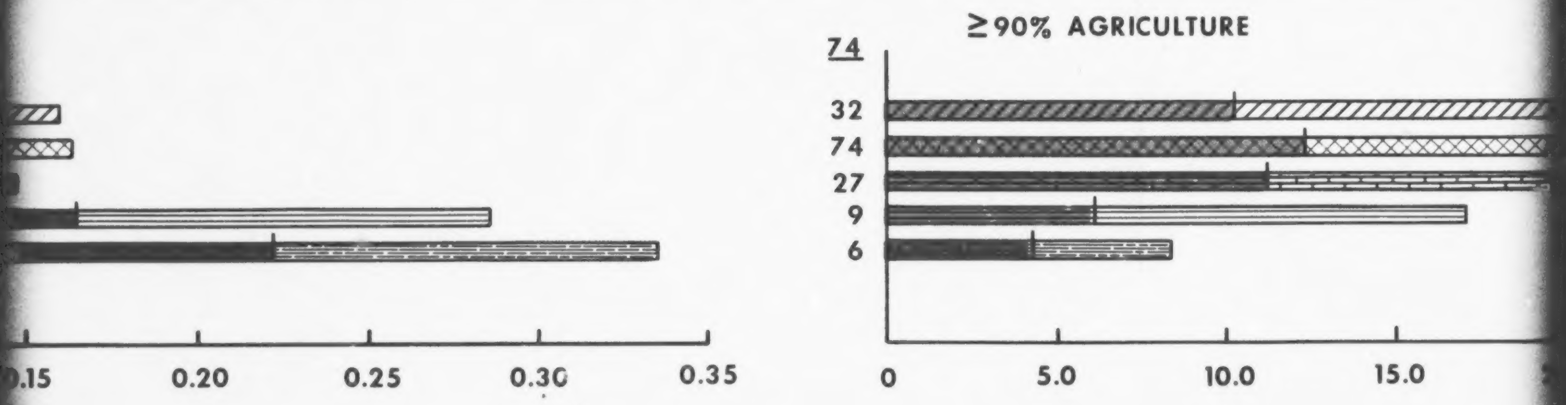
≥90% AGRICULTURE

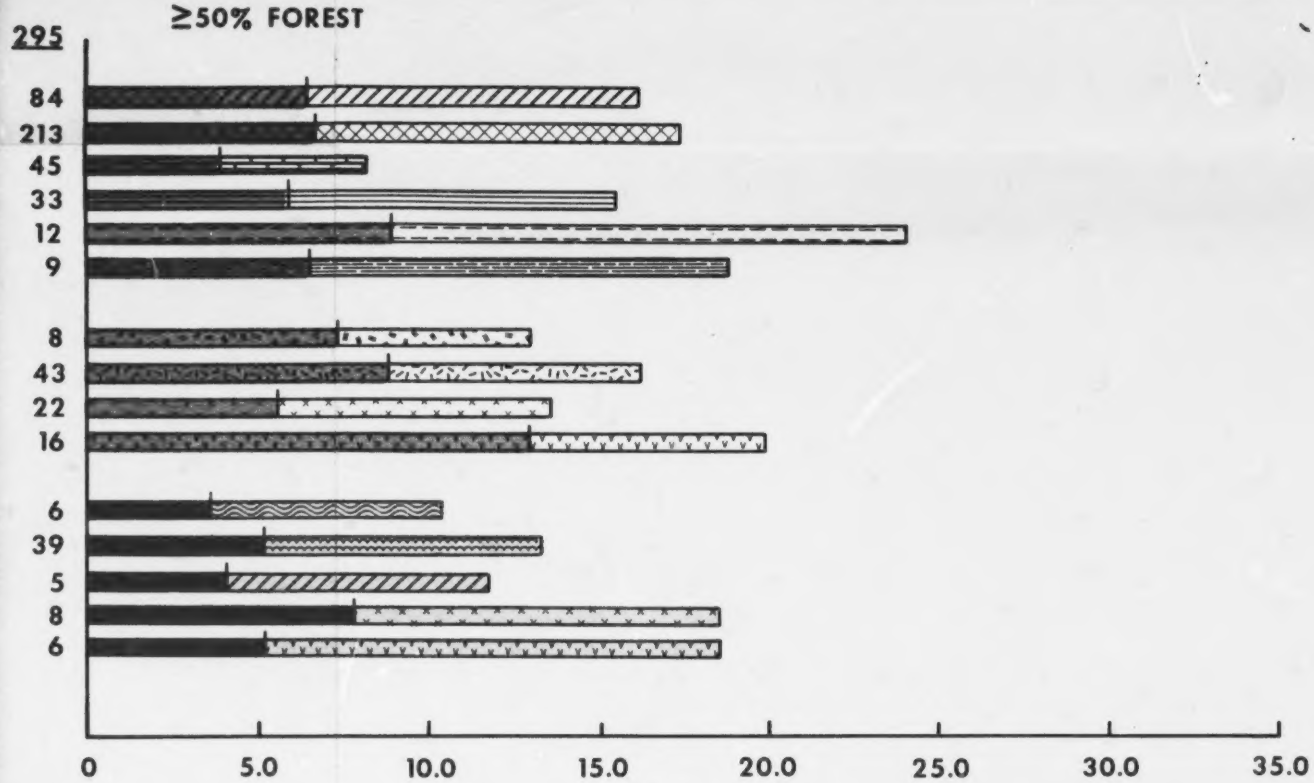


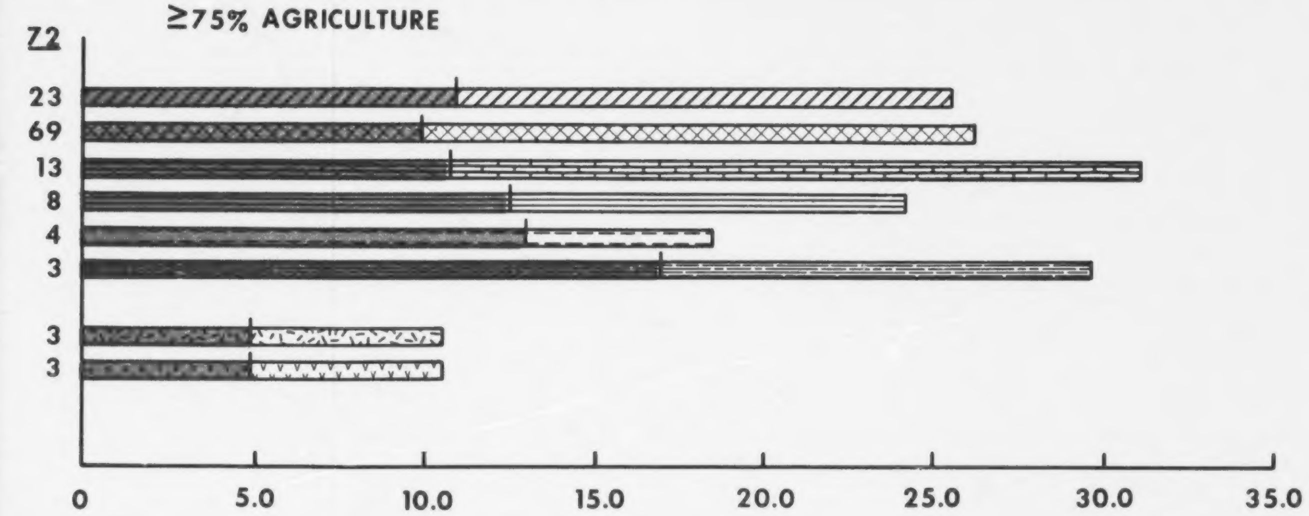
F

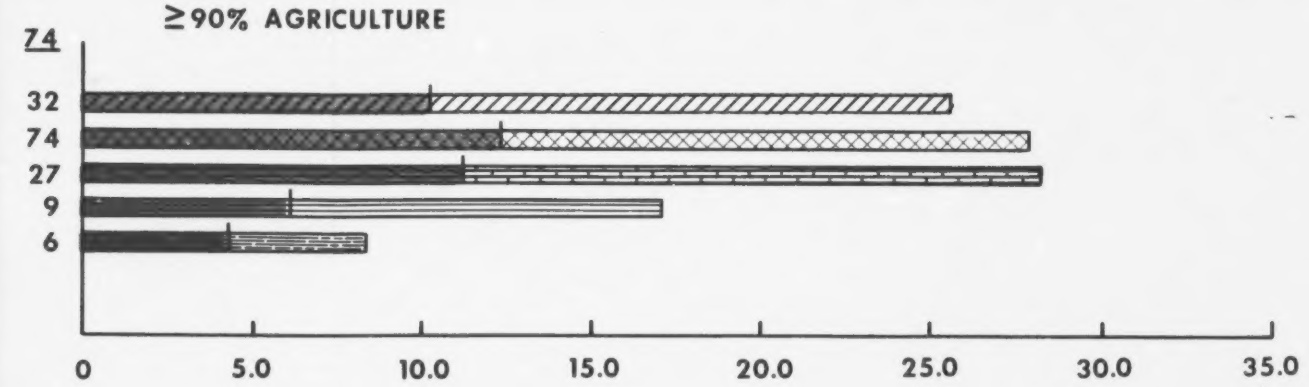

≥50% FOREST
295
84
213
45
33
12
9
8
43
22
16
6
39
5
8
6
.03
.04
.05
.06
.07
0
5.0
10.0
15.0
20


≥75% AGRICULTURE
72
23
69
13
8
4
3
3
3
0.15
0.20
0.25
0.30
0.35
0
5.0
10.0
15.0


≥90% AGRICULTURE
74
32
74
27
9
6
0.15
0.20
0.25
0.30
0.35
0
5.0
10.0
15.0


≥50% FOREST
295
84
213
45
33
12
9
8
43
22
16
6
39
5
8
6
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0


≥75% AGRICULTURE
72
23
69
13
8
4
3
3
3
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0

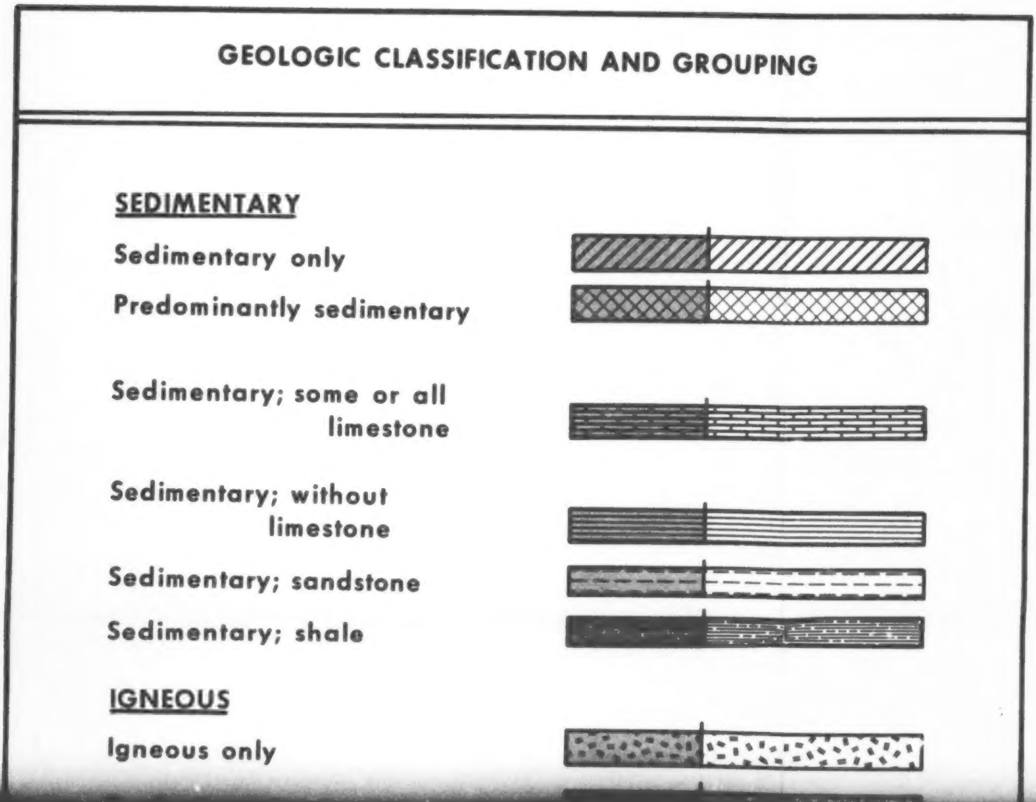

≥90% AGRICULTURE
74
32
74
27
9
6
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0

H

ft

Figure 30.

GEOLOGIC CLASSIFICATION AND MEAN ANNUAL STREAM NITRO CONCENTRATIONS AND EXPORTS FROM A NATIONWIDE SET OF 586 NONPOINT SOURCE WATERSHEDS. DATA GROUPED BY OVERALL LAND USE CATEGORY.

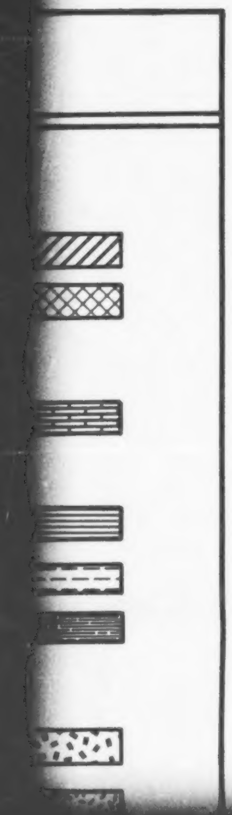

GEOLOGIC CLASSIFICATION AND GROUPING
SEDIMENTARY
Sedimentary only
Predominantly sedimentary
Sedimentary; some or all limestone
Sedimentary; without limestone
Sedimentary; sandstone
Sedimentary; shale
IGNEOUS
Igneous only

STREAM NITROGEN

NATIONWIDE

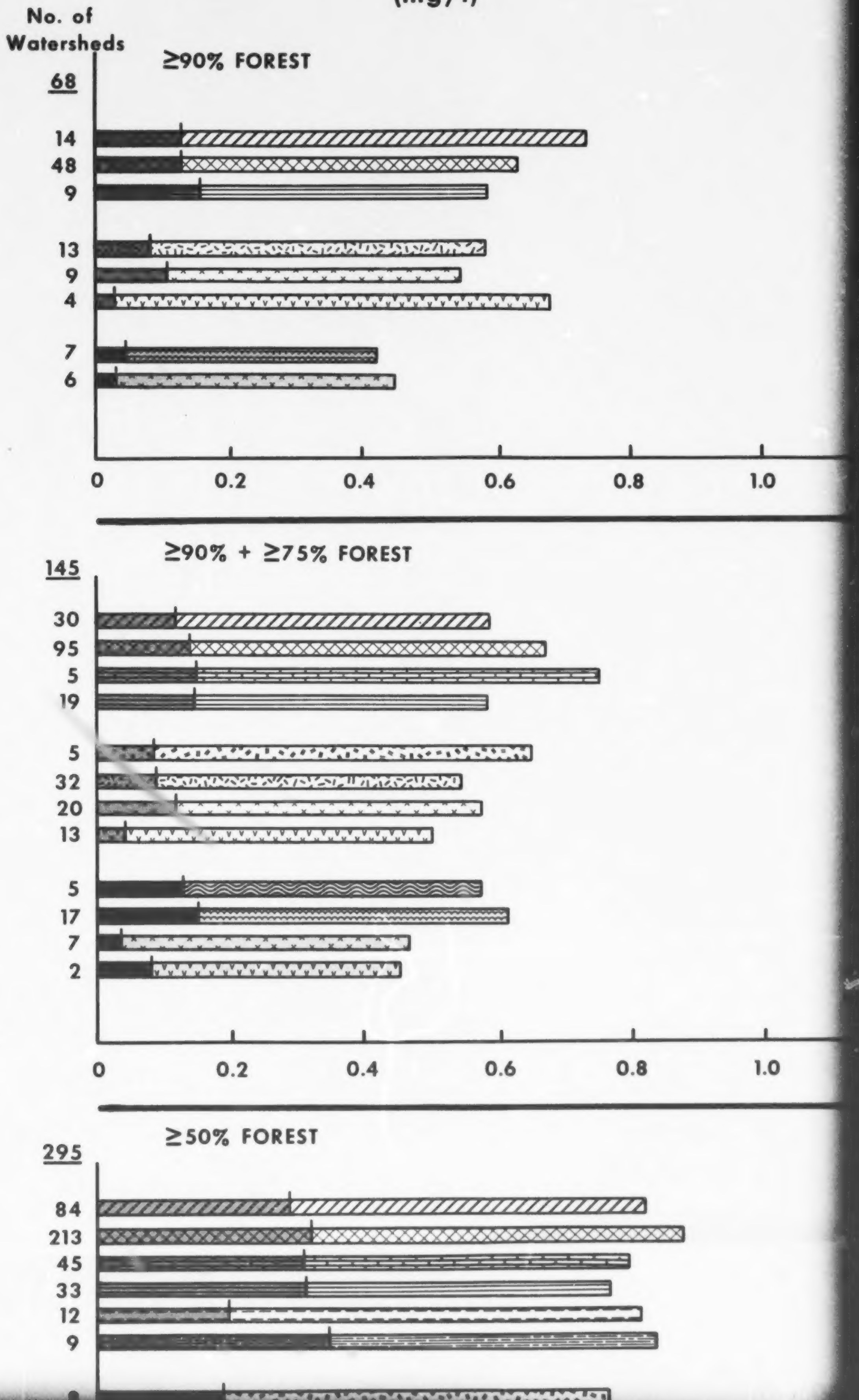
RSHEDS.

CATEGORY.



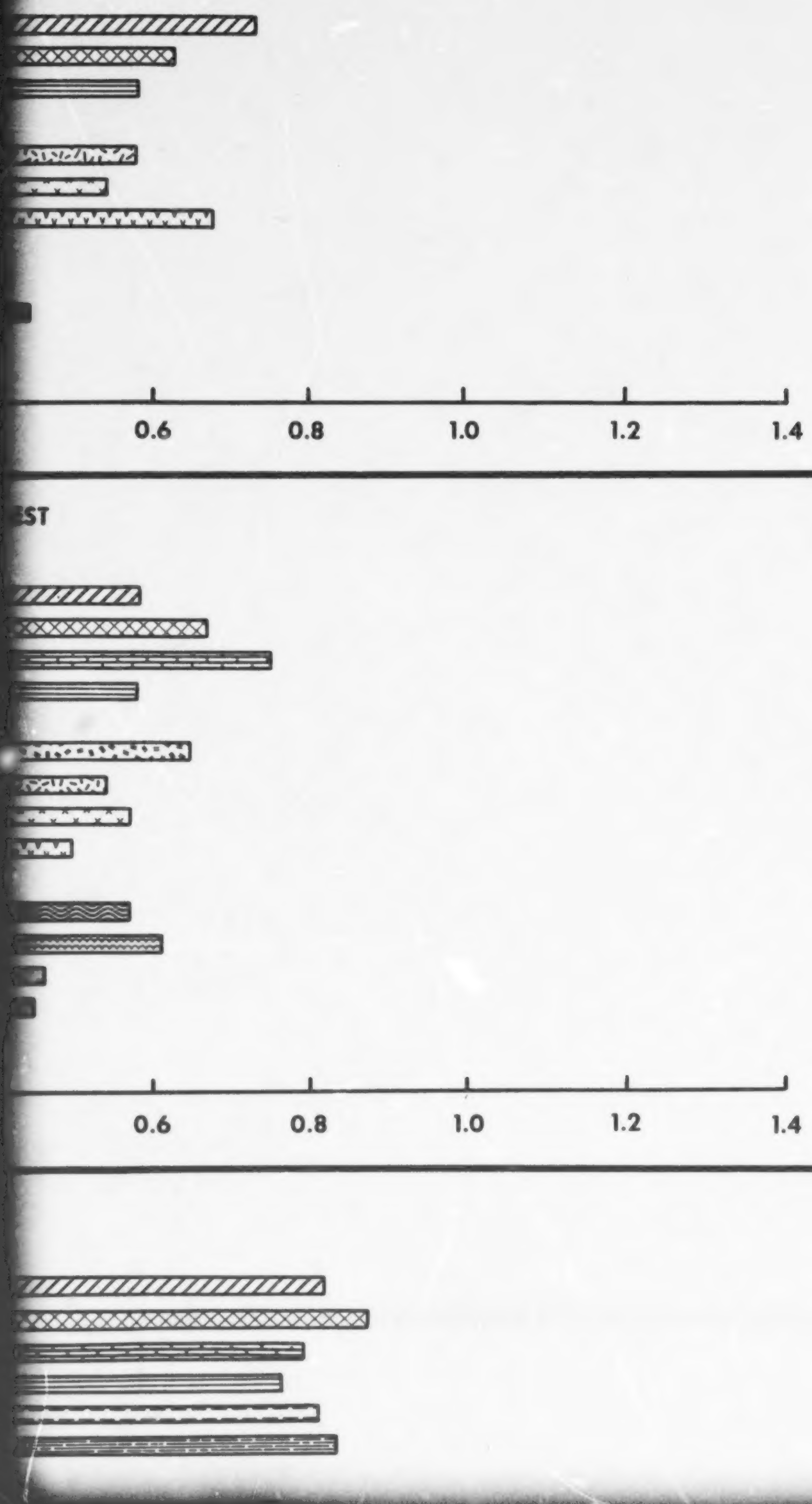
B

MEAN TOTAL NITROGEN AND MEAN INORGANIC NITROGEN CONCENTRATIONS (mg/l)

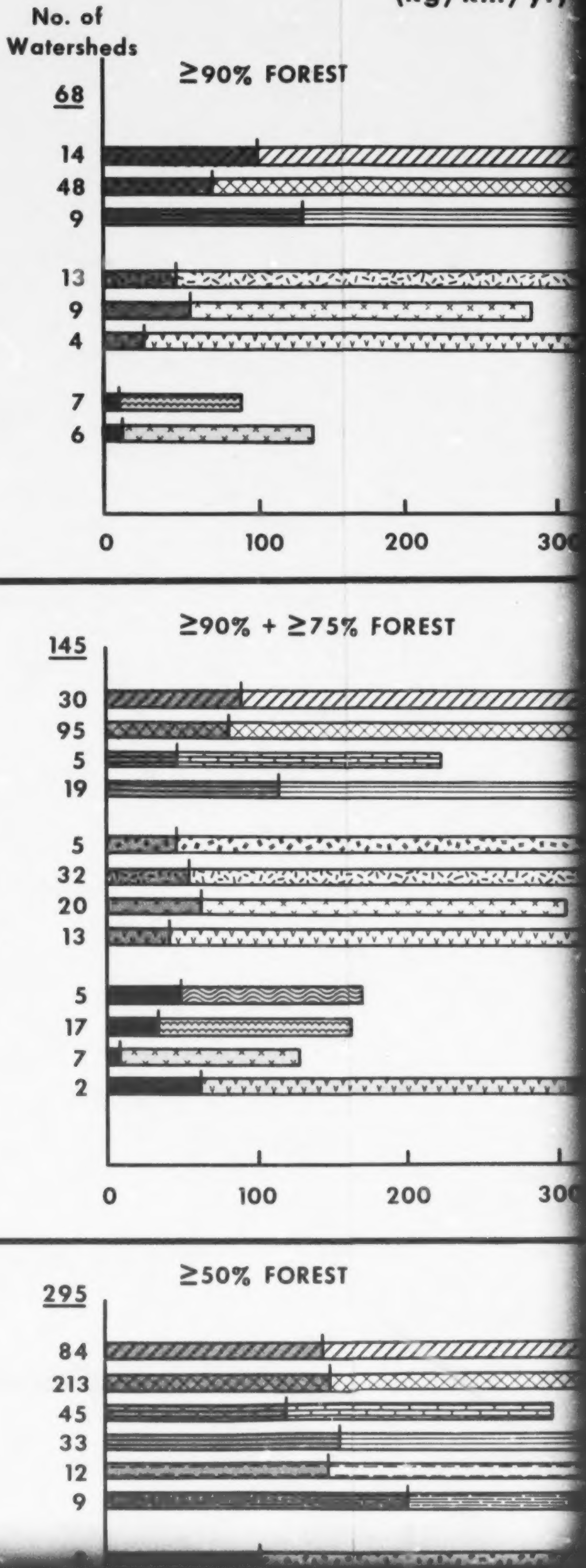


ITROGEN AND MEAN
TROGEN CONCENTRATIONS
(mg/l)

C

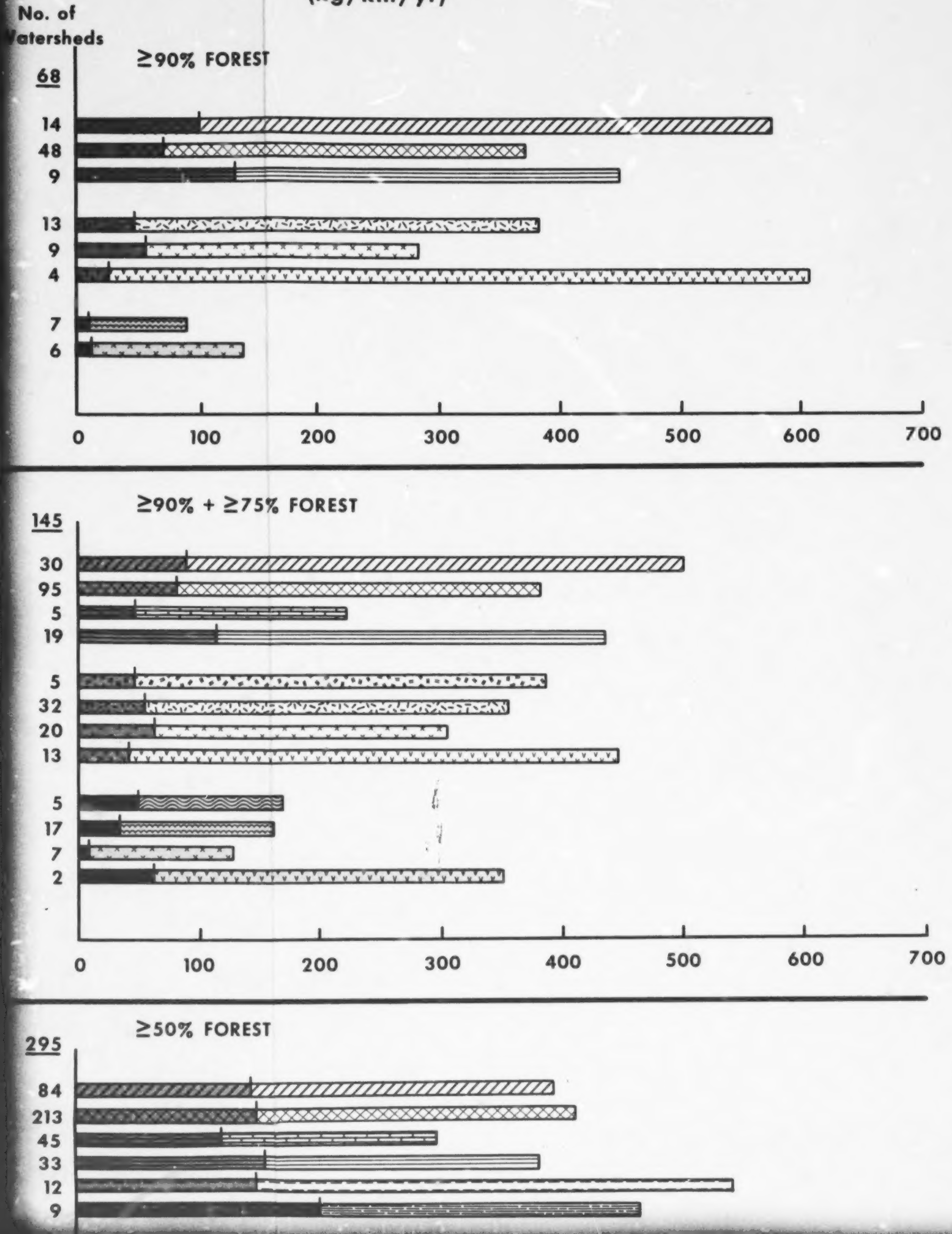


MEAN TOTAL NITROGEN
INORGANIC NITROGEN E
(kg/km/yr)



MEAN TOTAL NITROGEN AND MEAN INORGANIC NITROGEN EXPORTS (kg/km/yr)

D



limestone ▨

Sedimentary; without limestone ▨

Sedimentary; sandstone ▨

Sedimentary; shale ▨

IGNEOUS

Igneous only ▨

Predominantly igneous ▨

Predominantly igneous; plutonic origin ▨

Predominantly igneous; volcanic origin ▨

METAMORPHIC

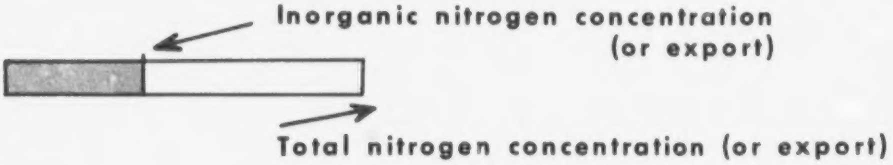
Metamorphic only ▨

Predominantly metamorphic ▨

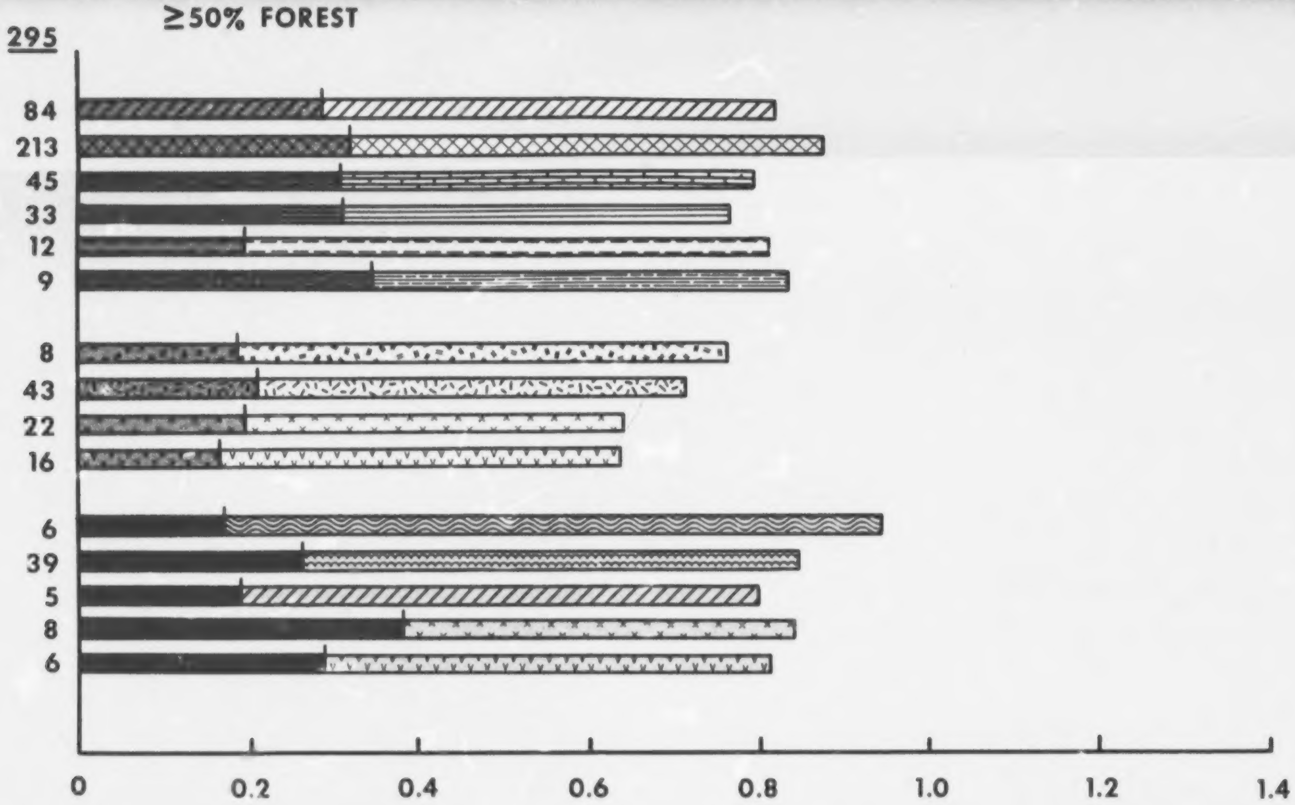
Metamorphic; derived from sedimentary ▨

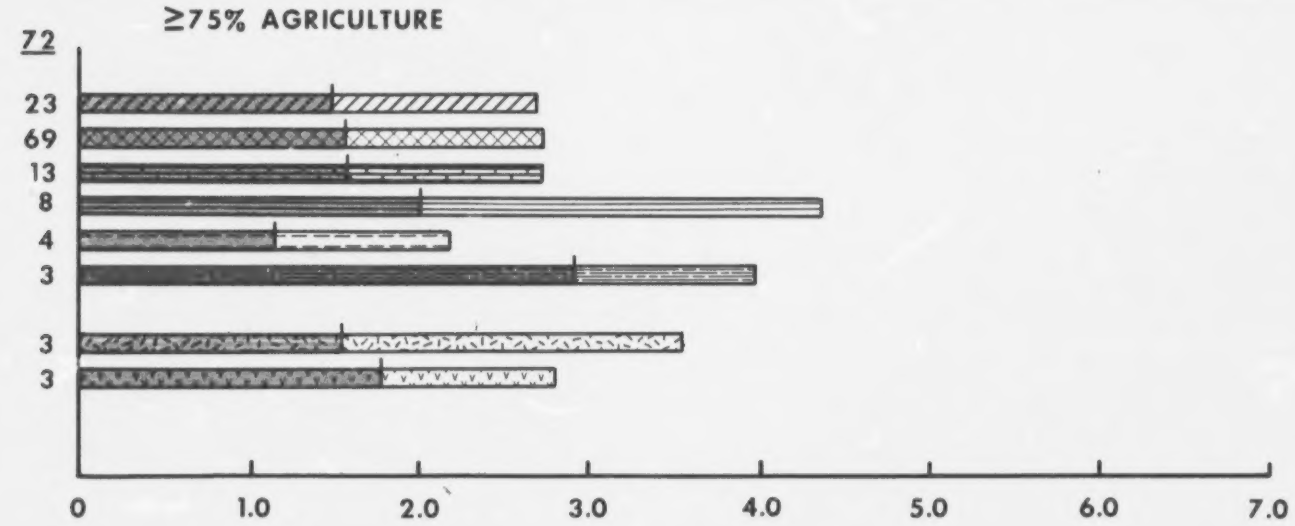
Metamorphic; derived from igneous of plutonic origin ▨

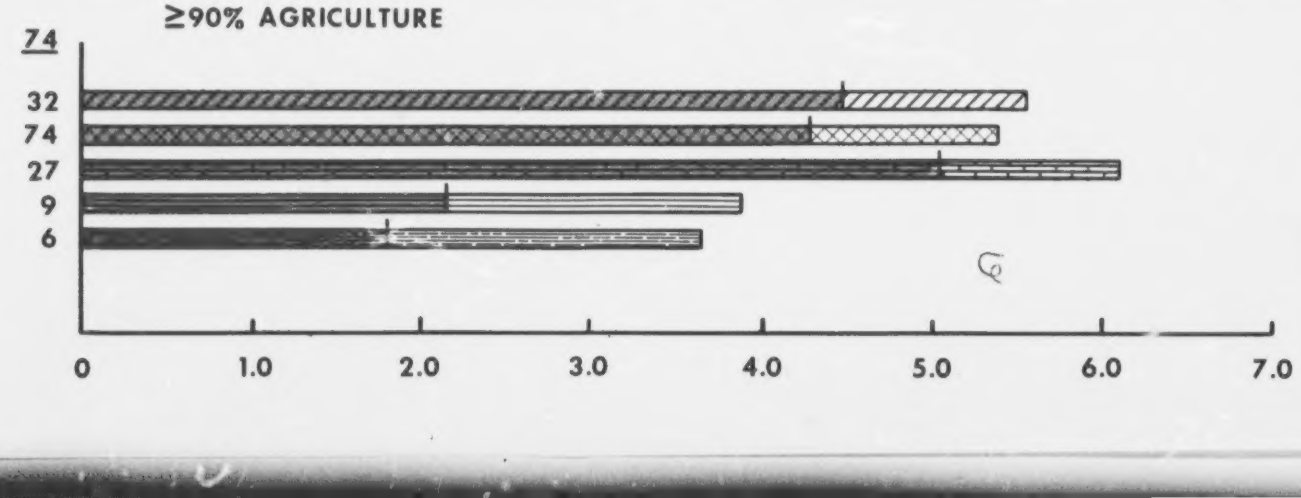
Metamorphic; derived from igneous of volcanic origin ▨


Inorganic nitrogen concentration (or export)
Total nitrogen concentration (or export)

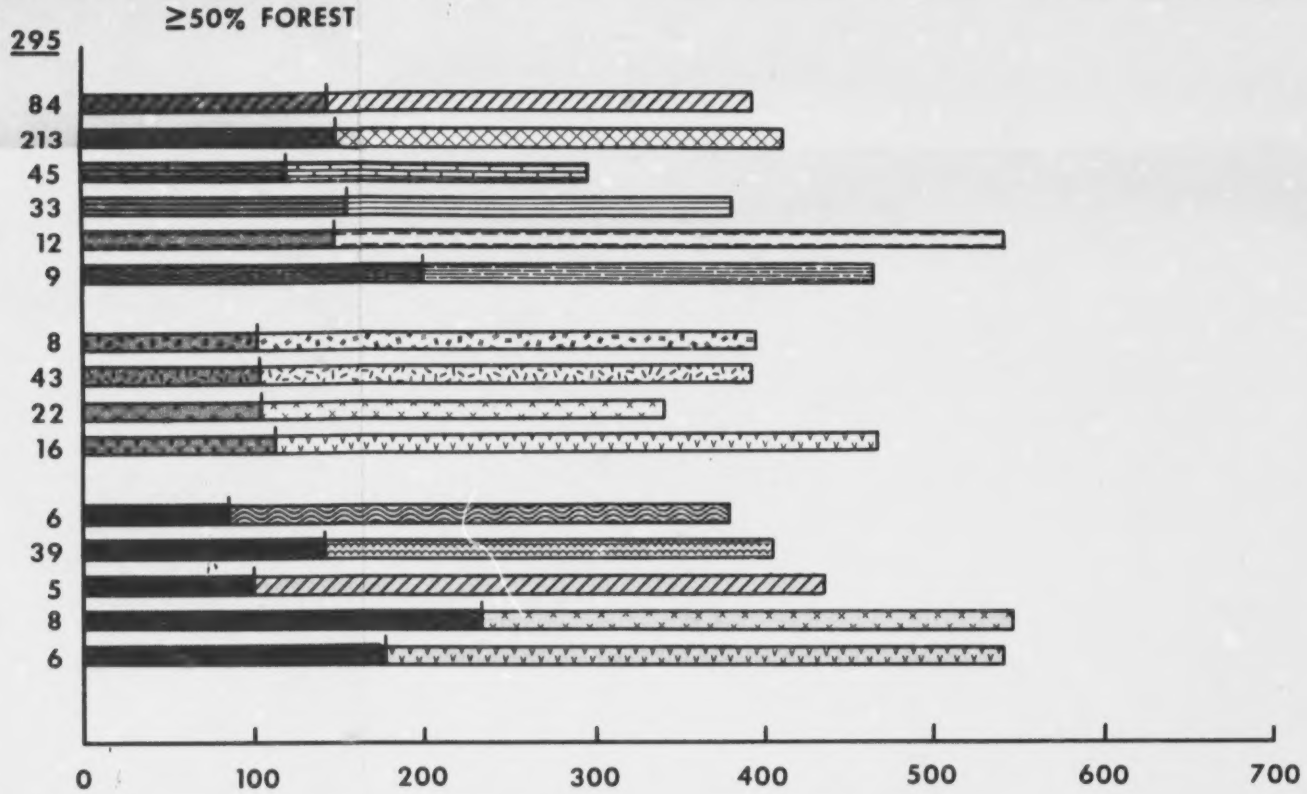
ε

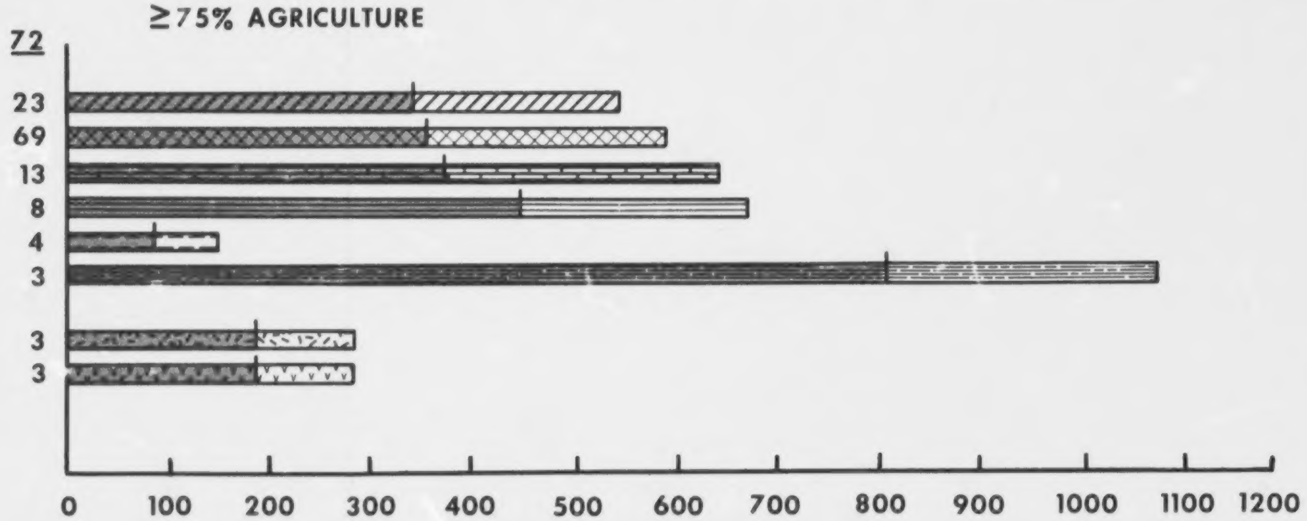

≥50% FOREST
295
84
213
45
33
12
9
8
43
22
16
6
39
5
8
6
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4

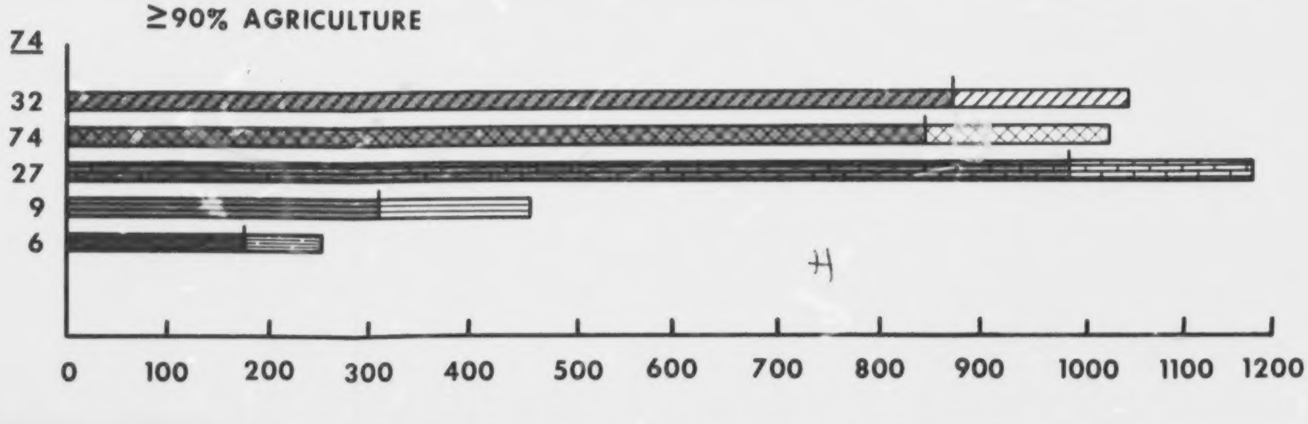

≥75% AGRICULTURE
72
23
69
13
8
4
3
3
3
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0


≥90% AGRICULTURE
74
32
74
27
9
6
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0

6

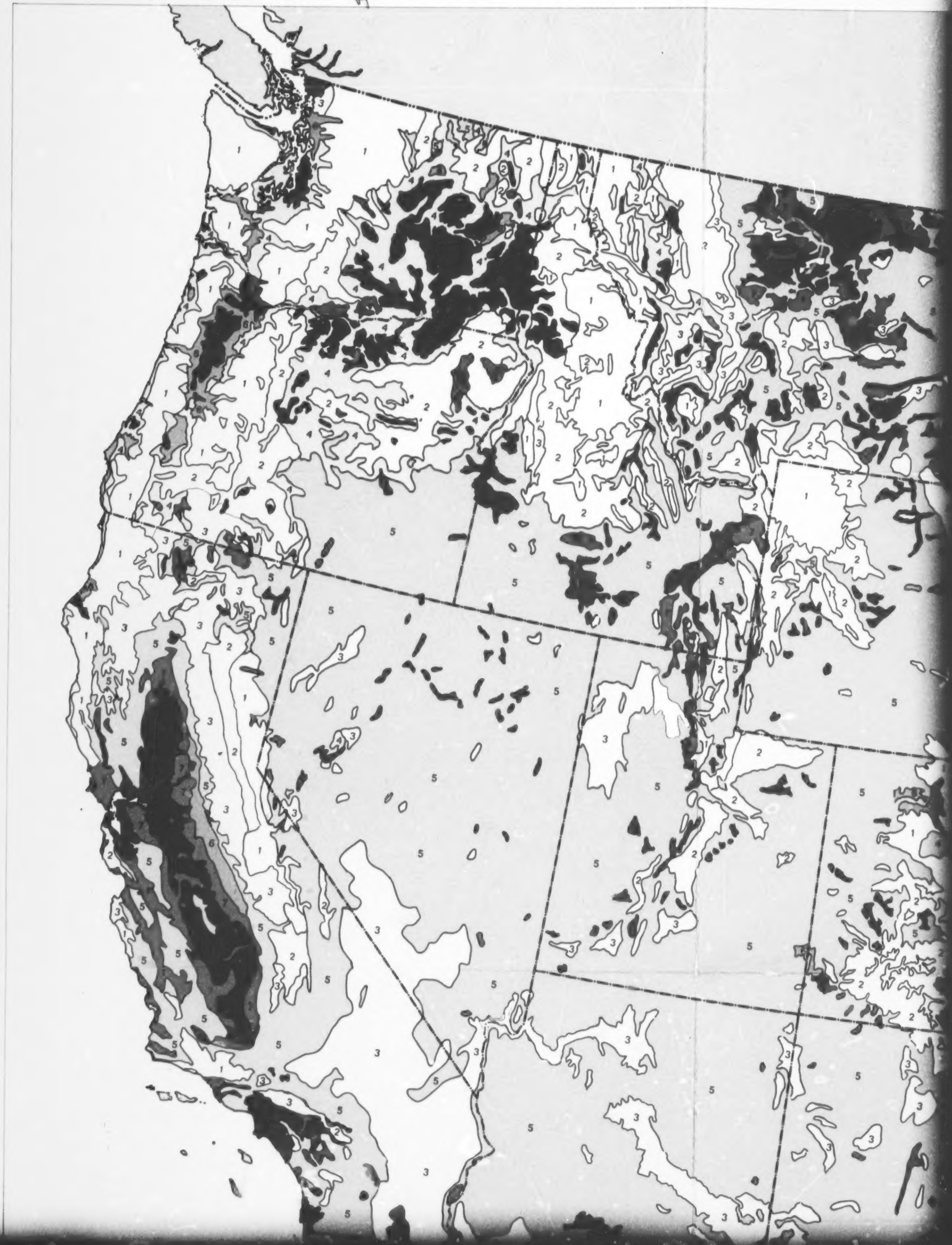

≥50% FOREST
295
84
213
45
33
12
9
8
43
22
16
6
39
5
8
6
0
100
200
300
400
500
600
700


≥75% AGRICULTURE
72
23
69
13
8
4
3
3
3
0
100
200
300
400
500
600
700
800
900
1000
1100
1200

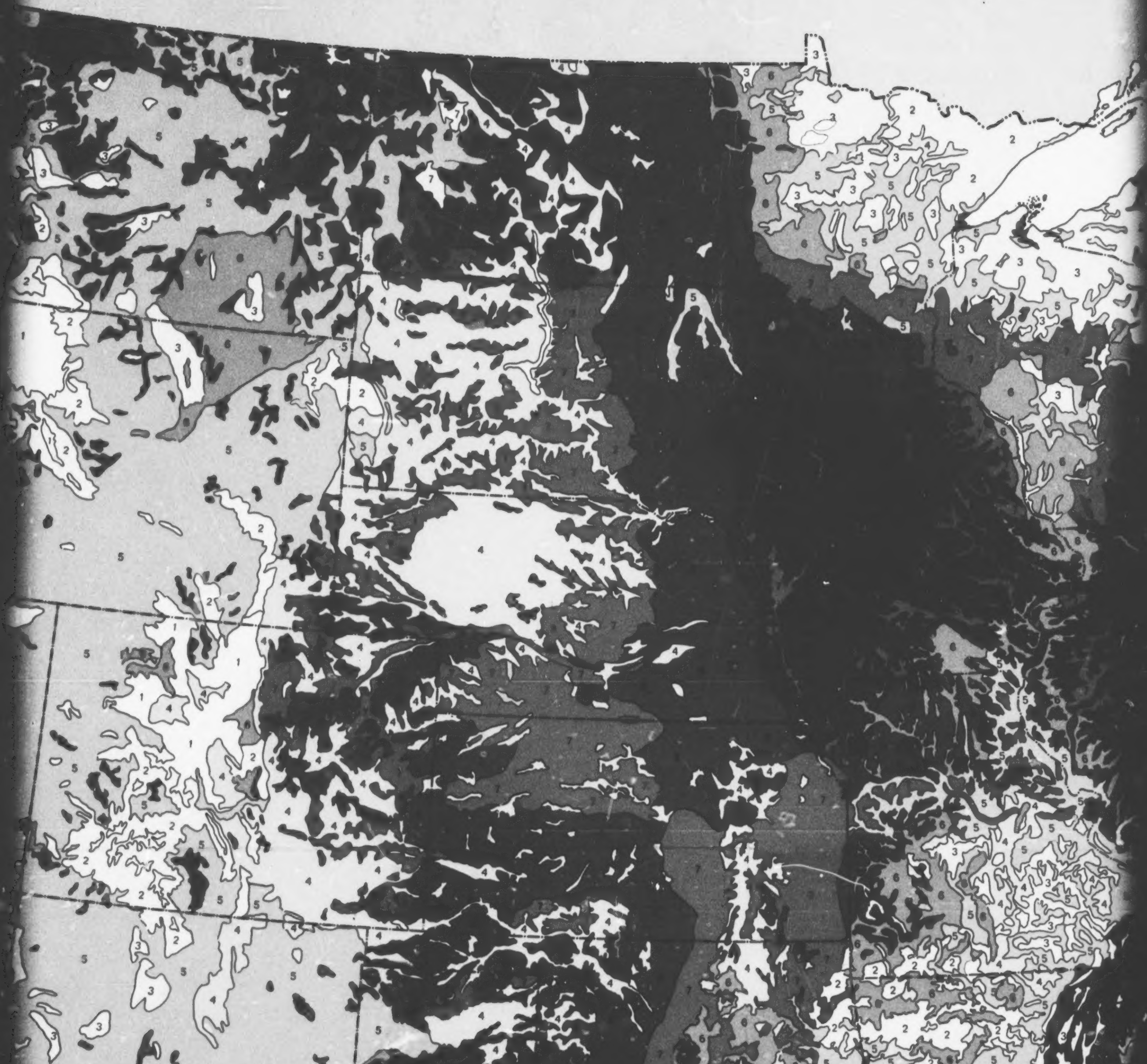

≥90% AGRICULTURE
74
32
74
27
9
6
0
100
200
300
400
500
600
700
800
900
1000
1100
1200

H

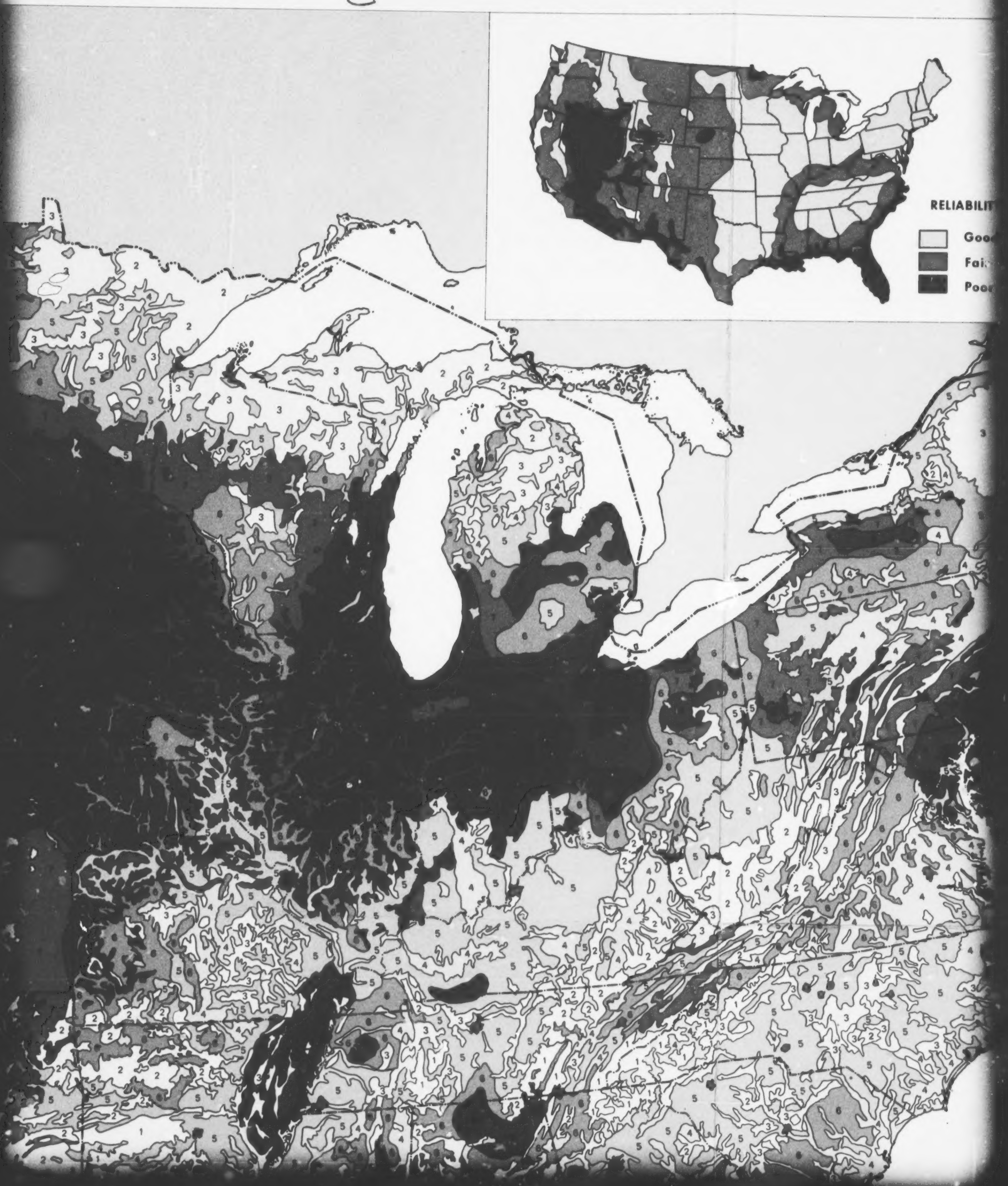
A



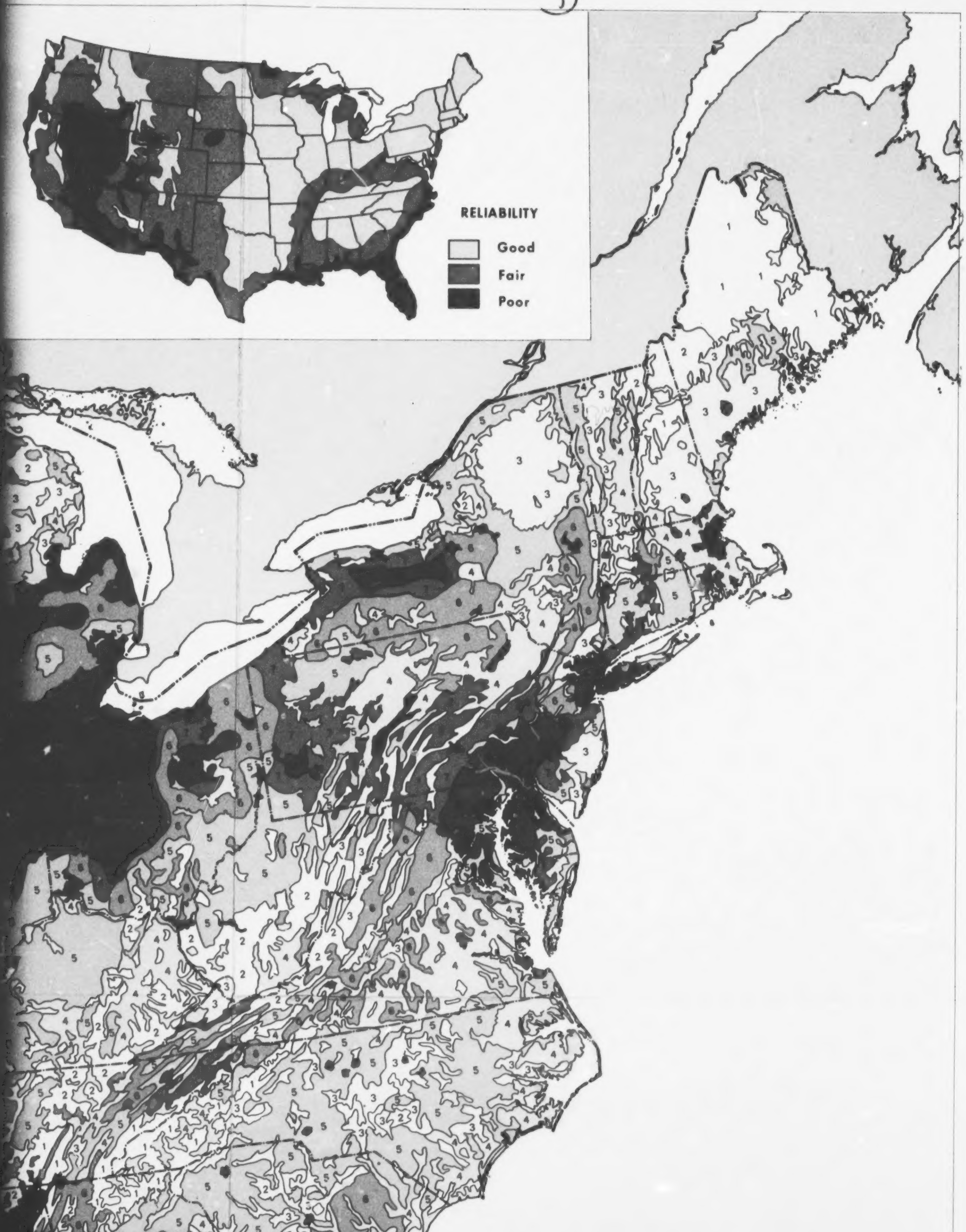
B

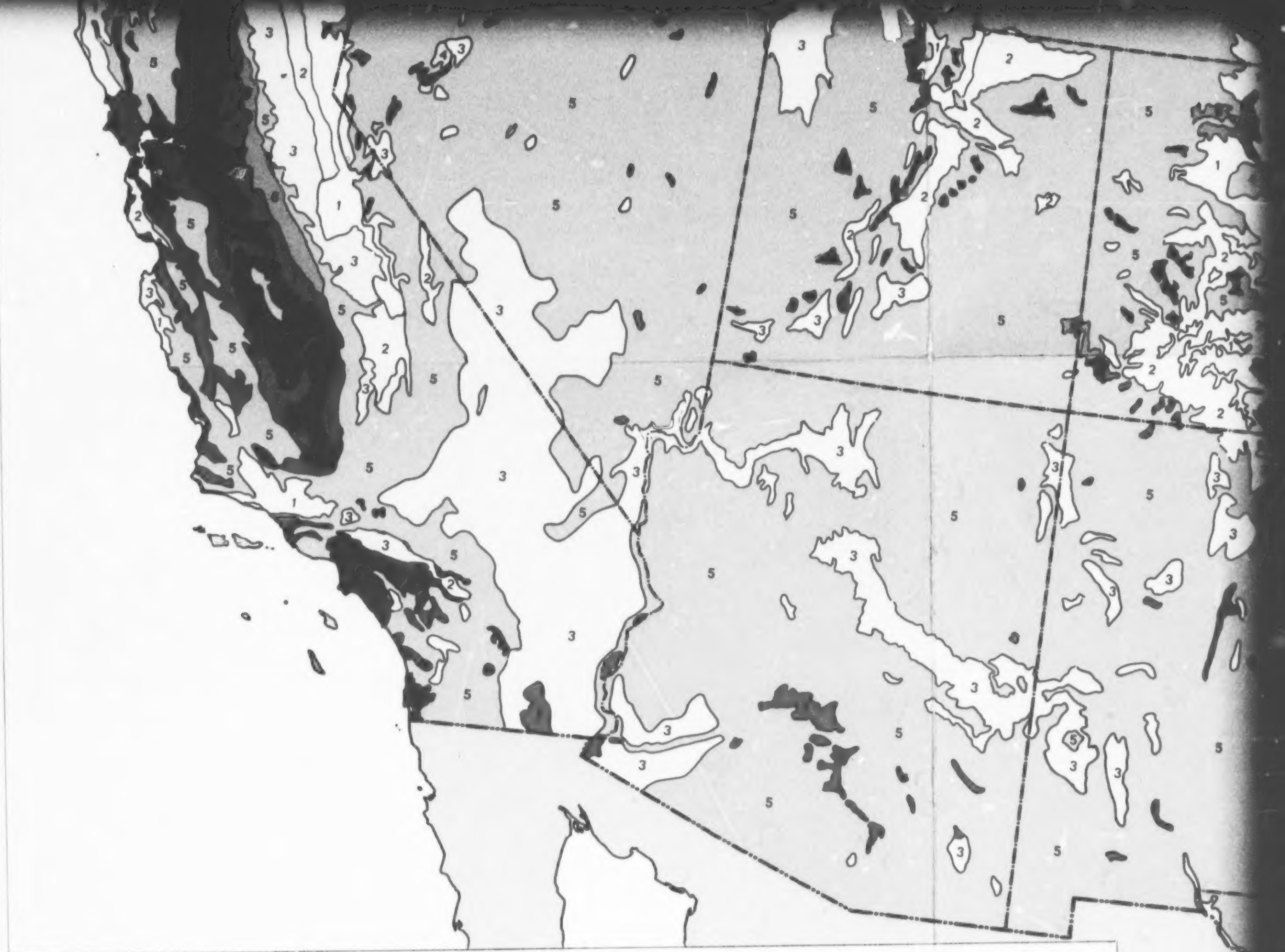


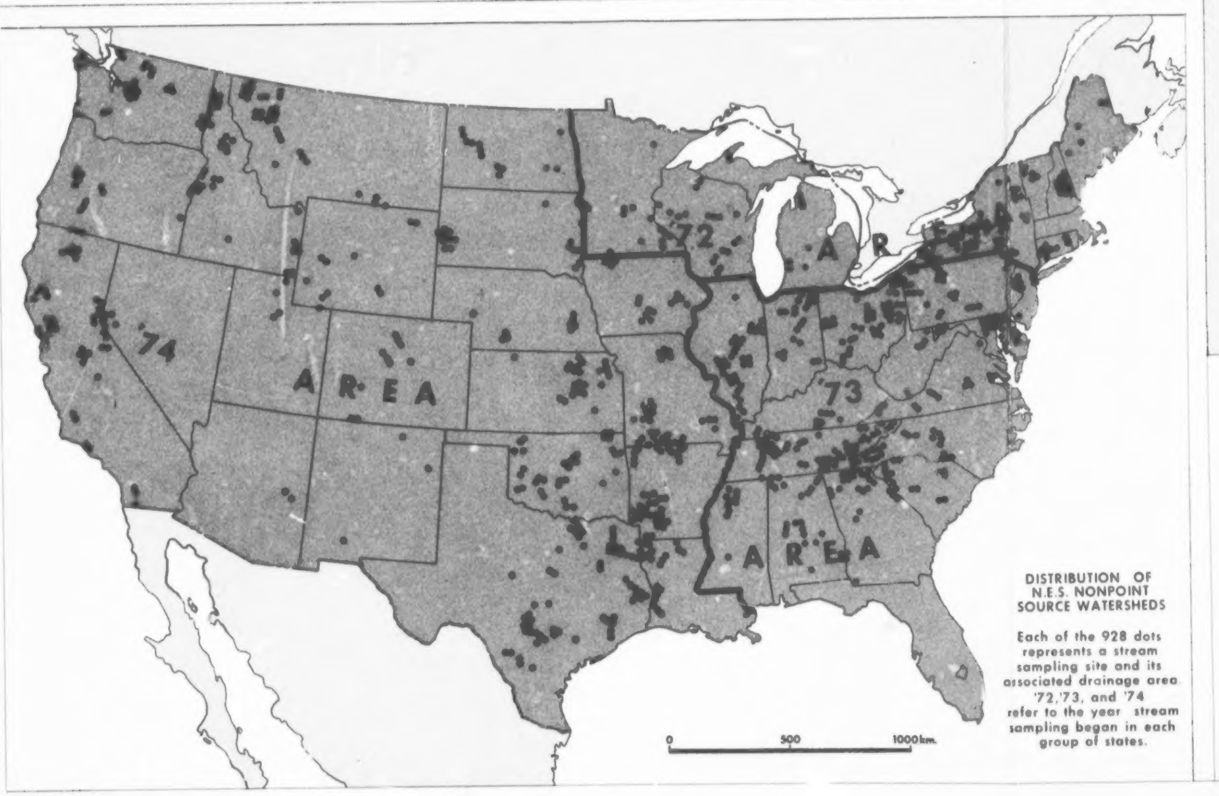
c


RELIABILIT
Good
Fai
Poo

D


RELIABILITY
Good
Fair
Poor





DISTRIBUTION OF N.E.S. NONPOINT SOURCE WATERSHEDS

Each of the 928 dots represents a stream sampling site and its associated drainage area. '72, '73, and '74 refer to the year stream sampling began in each group of states.

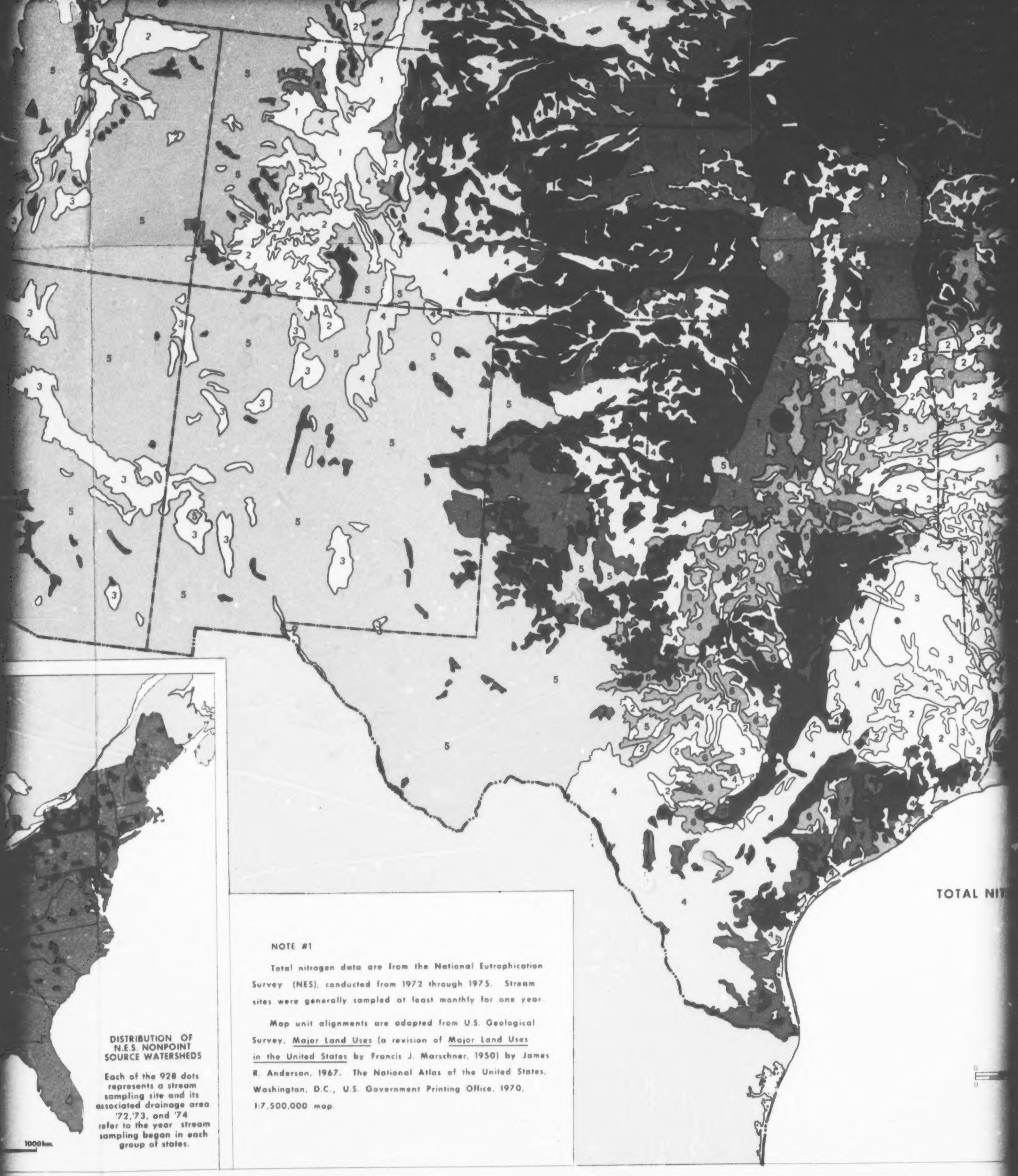
NOTE #1

Total nitrog
Survey (NES),
sites were gene

Map unit
Survey, Major
in the United
R. Anderson,
Washington, D.
1:7,500,000

Department of Geography, Cartographic Service, Oregon State University

ε



DISTRIBUTION OF
N.E.S. NONPOINT
SOURCE WATERSHEDS

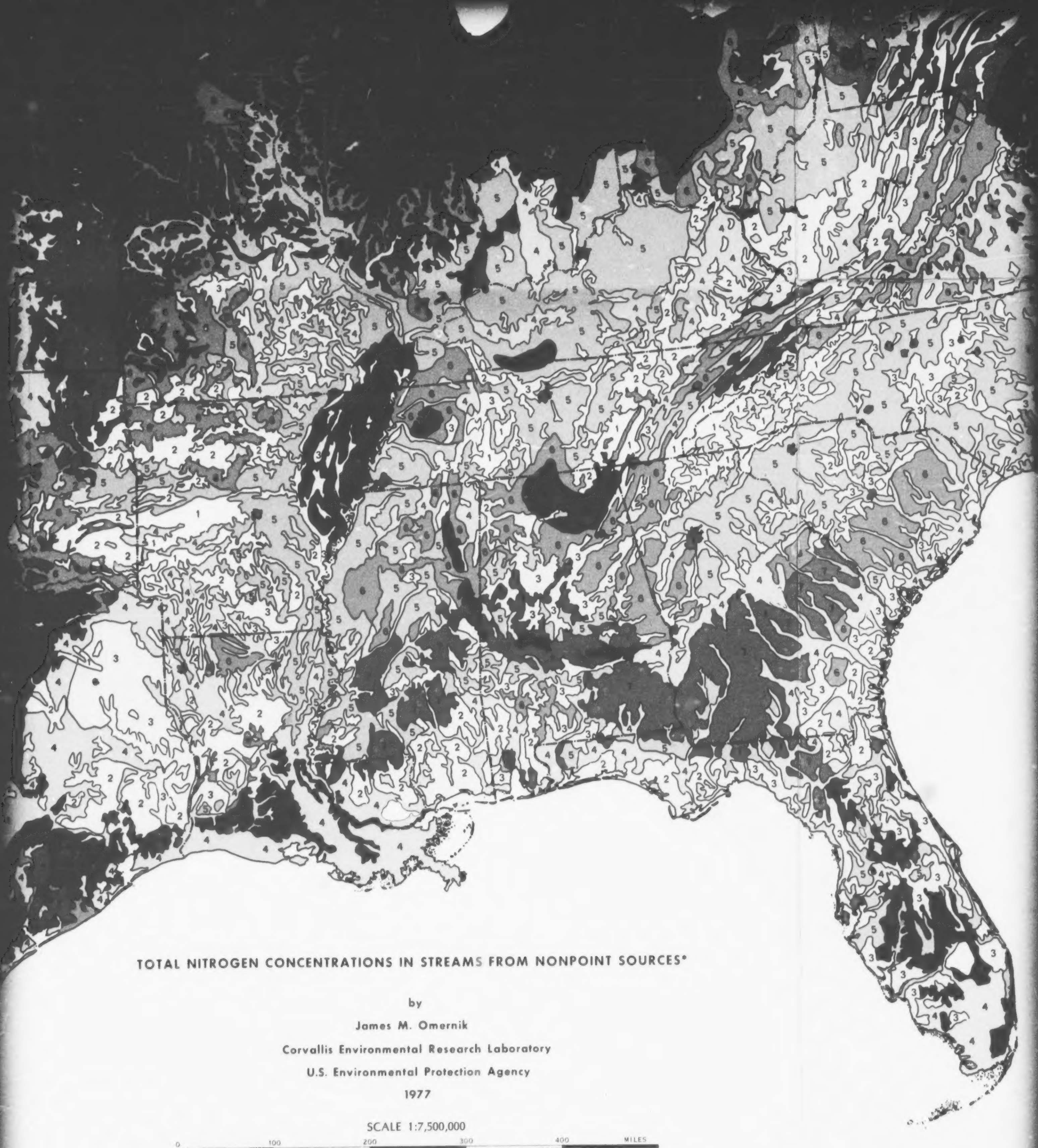
Each of the 928 dots represents a stream sampling site and its associated drainage area. '72,'73, and '74 refer to the year stream sampling began in each group of states.

NOTE #1

Total nitrogen data are from the National Eutrophication Survey (NES), conducted from 1972 through 1975. Stream sites were generally sampled at least monthly for one year.

Map unit alignments are adapted from U.S. Geological Survey, Major Land Uses (a revision of Major Land Uses in the United States by Francis J. Marschner, 1950) by James R. Anderson, 1967. The National Atlas of the United States, Washington, D.C., U.S. Government Printing Office, 1970, 1:7,500,000 map.

F

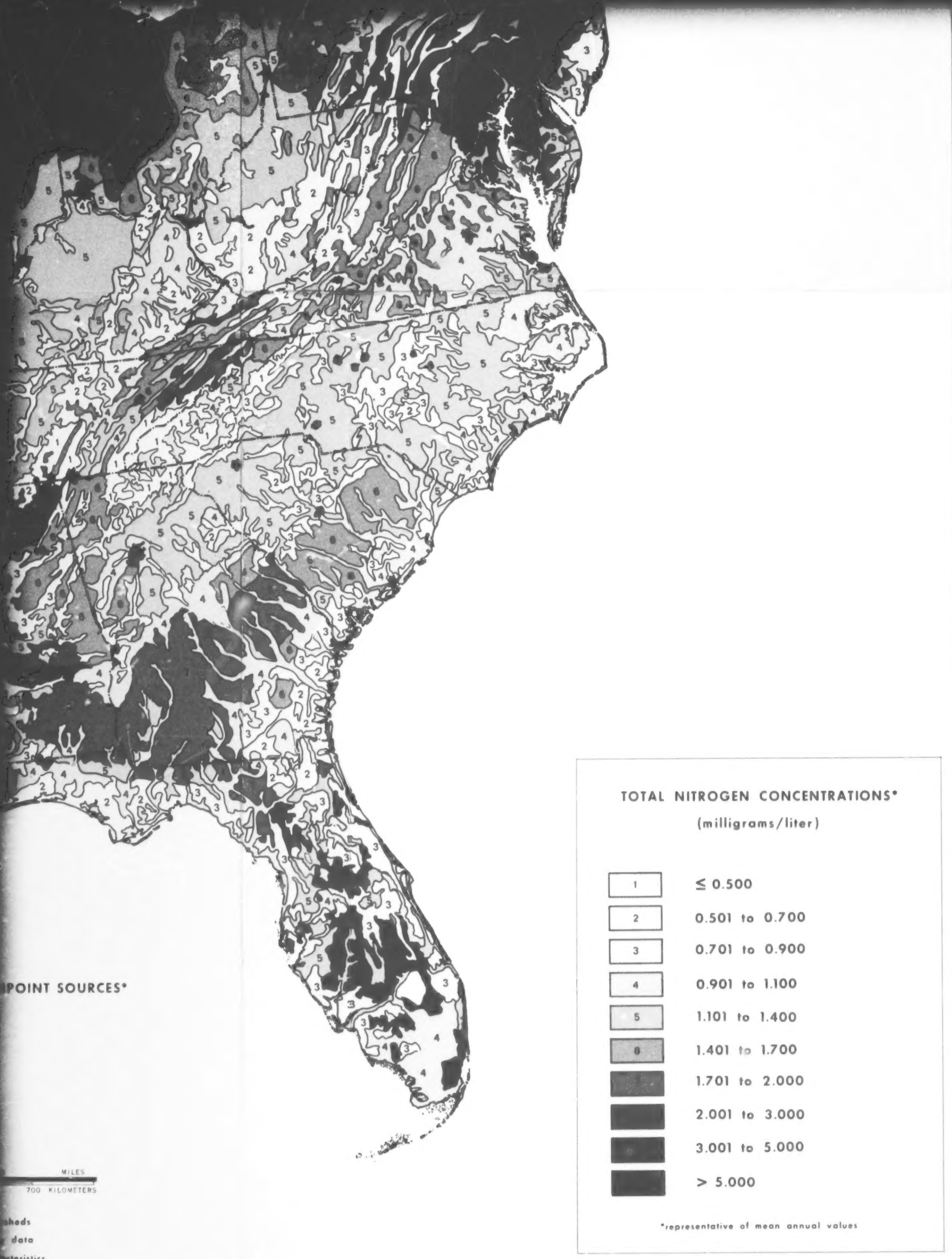

SCALE 1:7,500,000
0
100
200
300
400
MILES
0
100
200
300
400
500
600
700
KILOMETERS

TOTAL NITROGEN CONCENTRATIONS IN STREAMS FROM NONPOINT SOURCES*

by

James M. Omernik
Corvallis Environmental Research Laboratory
U.S. Environmental Protection Agency
1977

*based on data from 928 sampling sites associated with watersheds containing only nonpoint sources and the relationships of these data to general land use categories and other macro watershed characteristics.

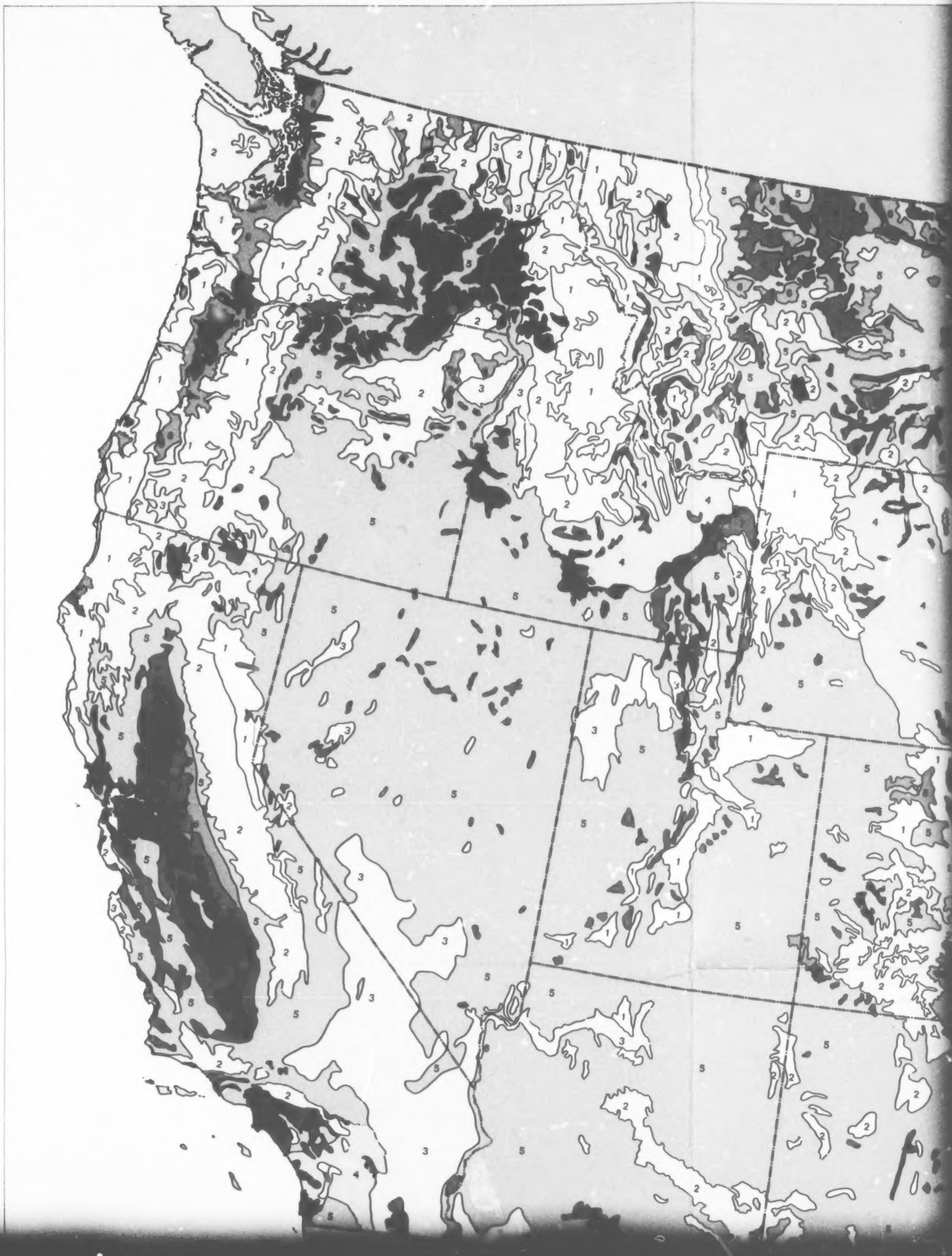

TOTAL NITROGEN CONCENTRATIONS*
(milligrams/liter)
1 ≤ 0.500
2 0.501 to 0.700
3 0.701 to 0.900
4 0.901 to 1.100
5 1.101 to 1.400
6 1.401 to 1.700
1.701 to 2.000
2.001 to 3.000
3.001 to 5.000
> 5.000
*representative of mean annual values
MILES
700 KILOMETERS
1
2
3
4
5
6

POINT SOURCES*

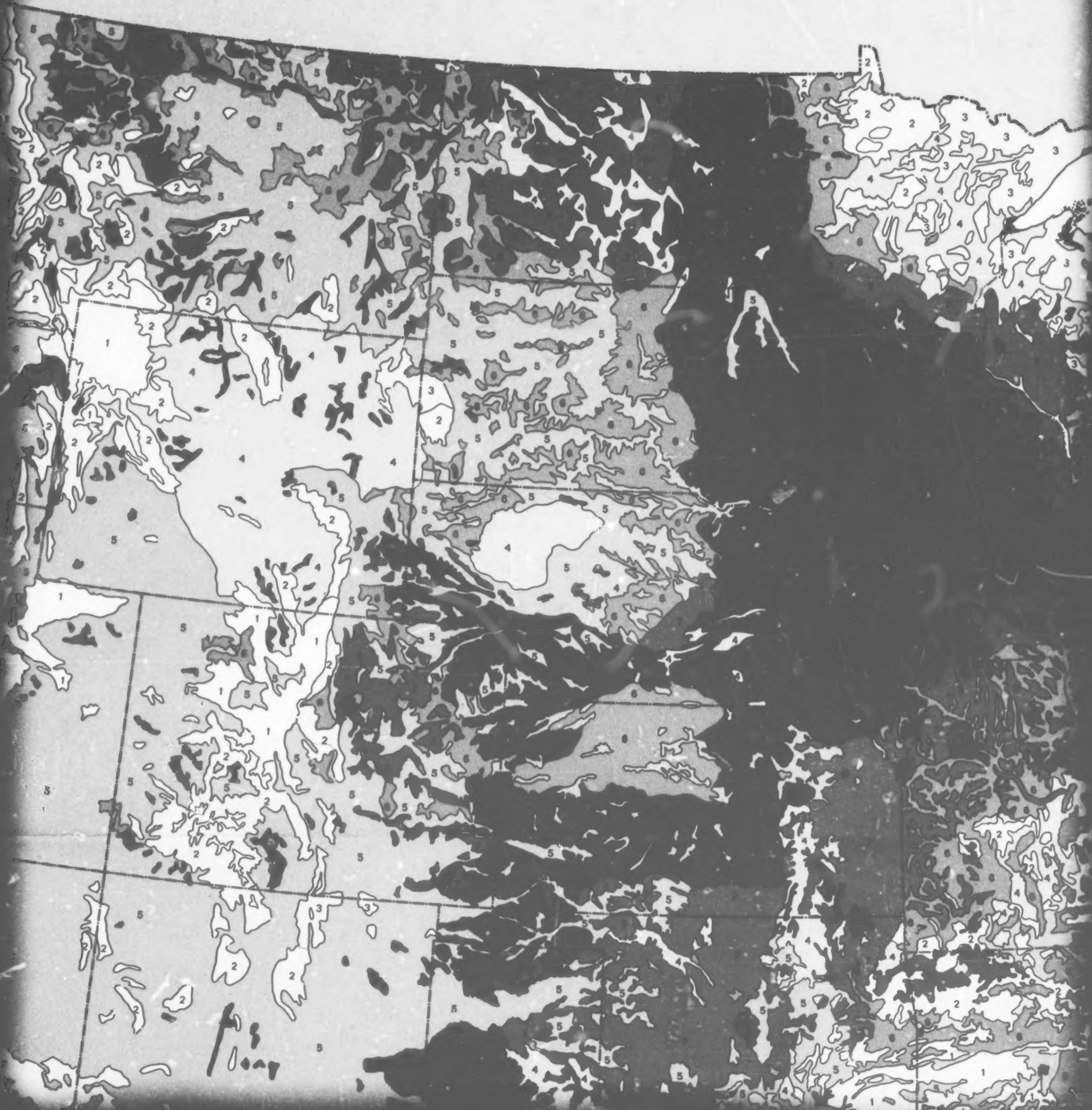
sheds
data
cteristics.

H

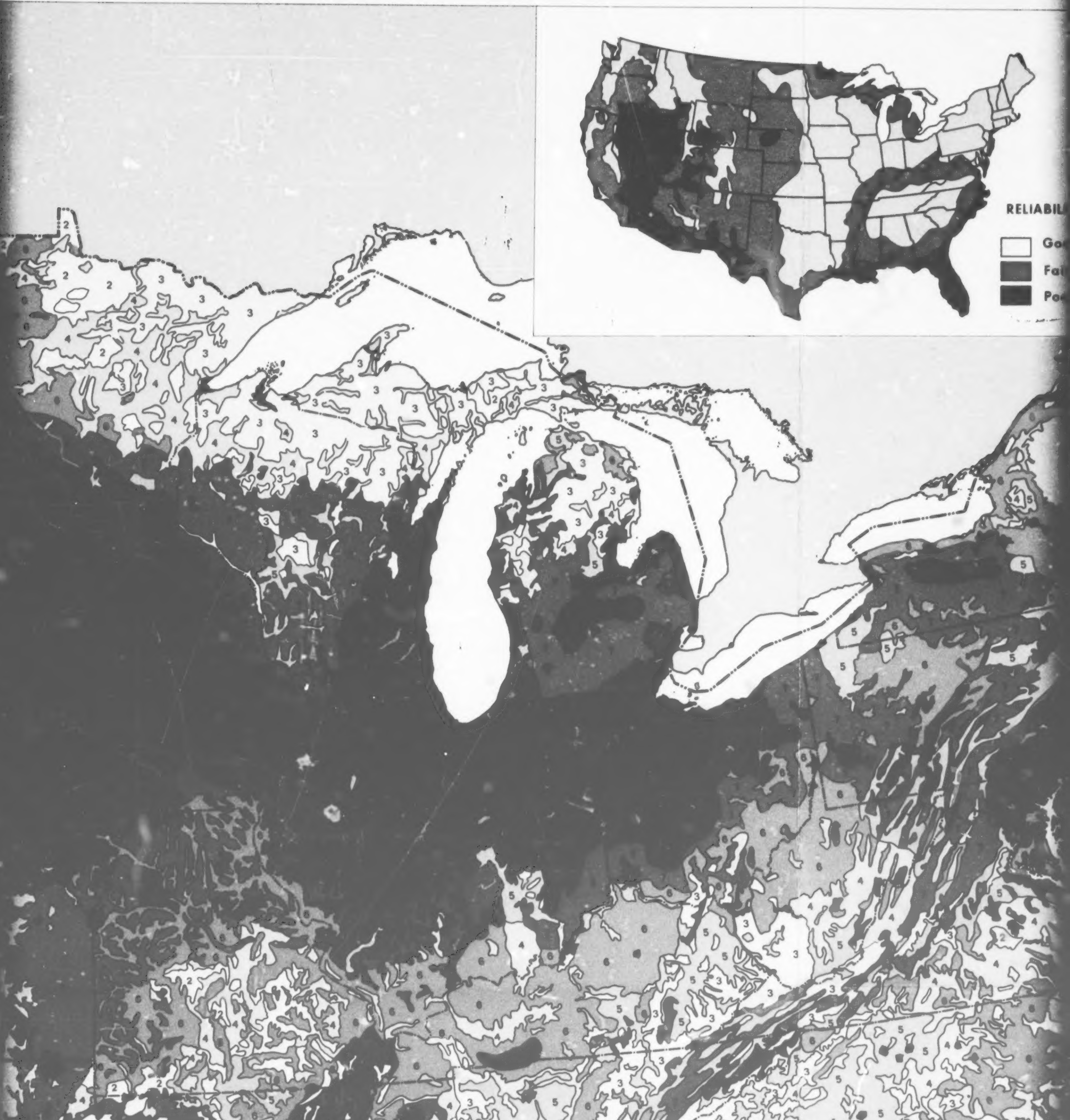
A



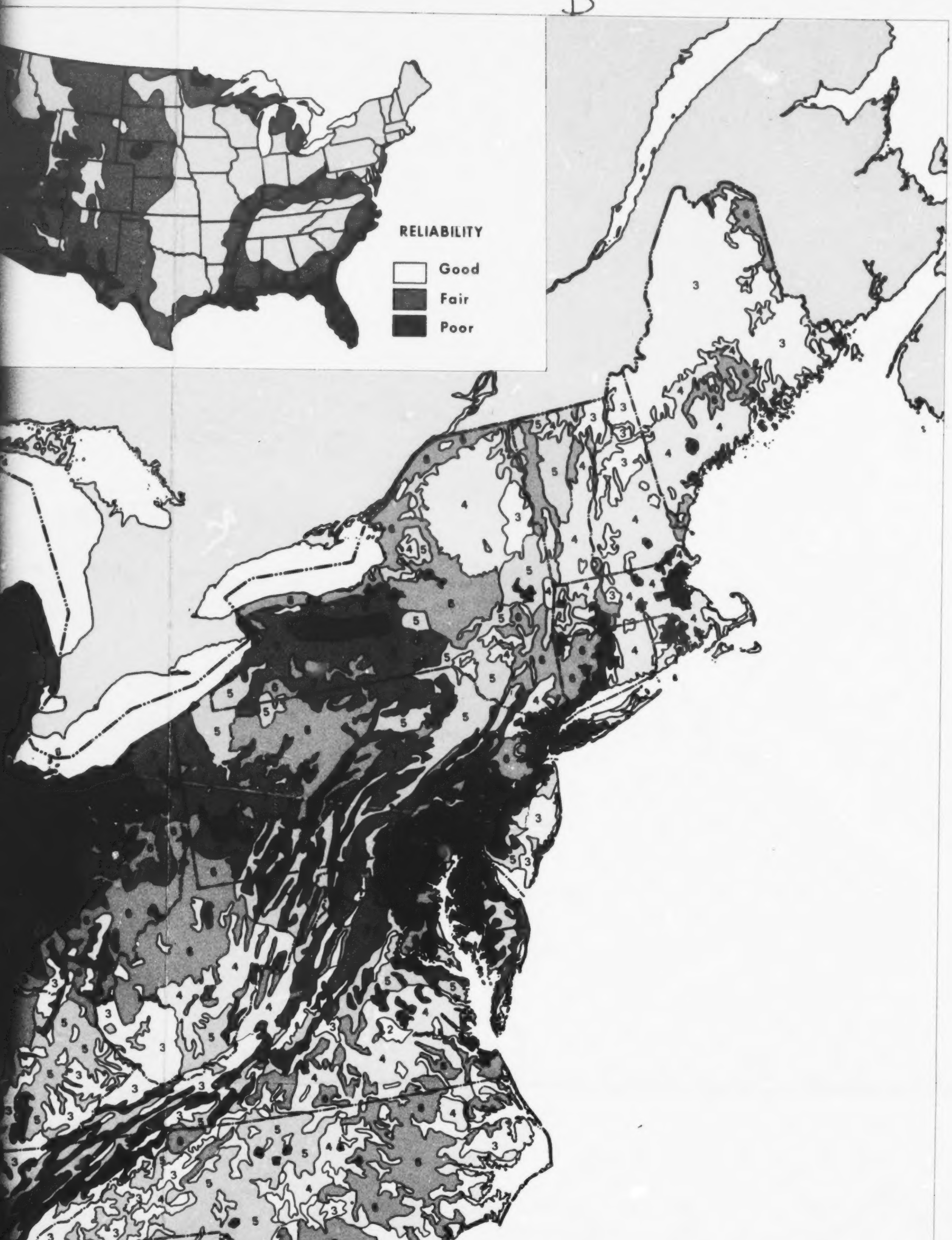
B

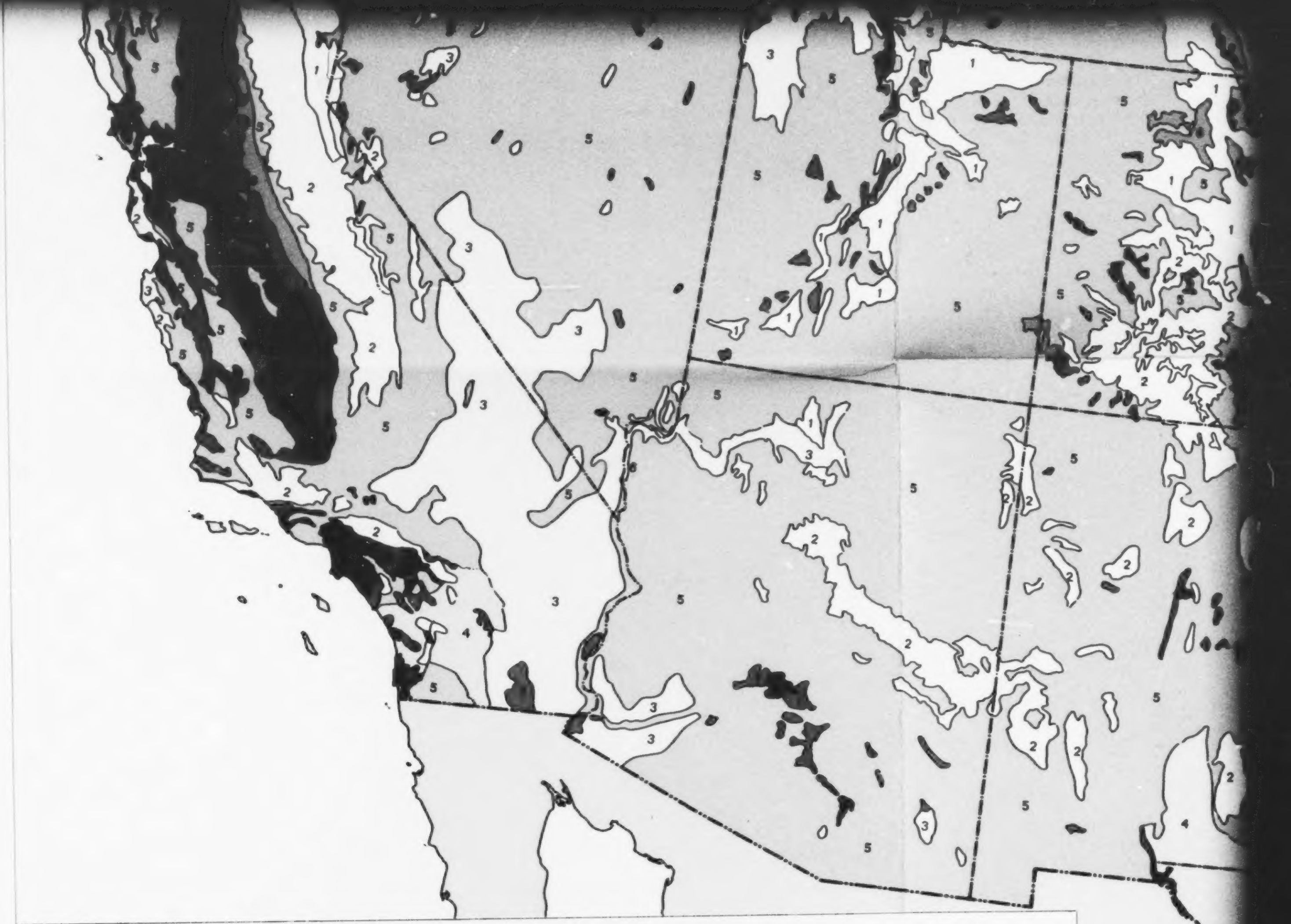


C


RELIABIL
Go
Fai
Po
1
2
3
4
5
6

D


RELIABILITY
☐ Good
▨ Fair
■ Poor



'72
'73
'74
A R E A
A R E A
A R E A
0
500
1000km.

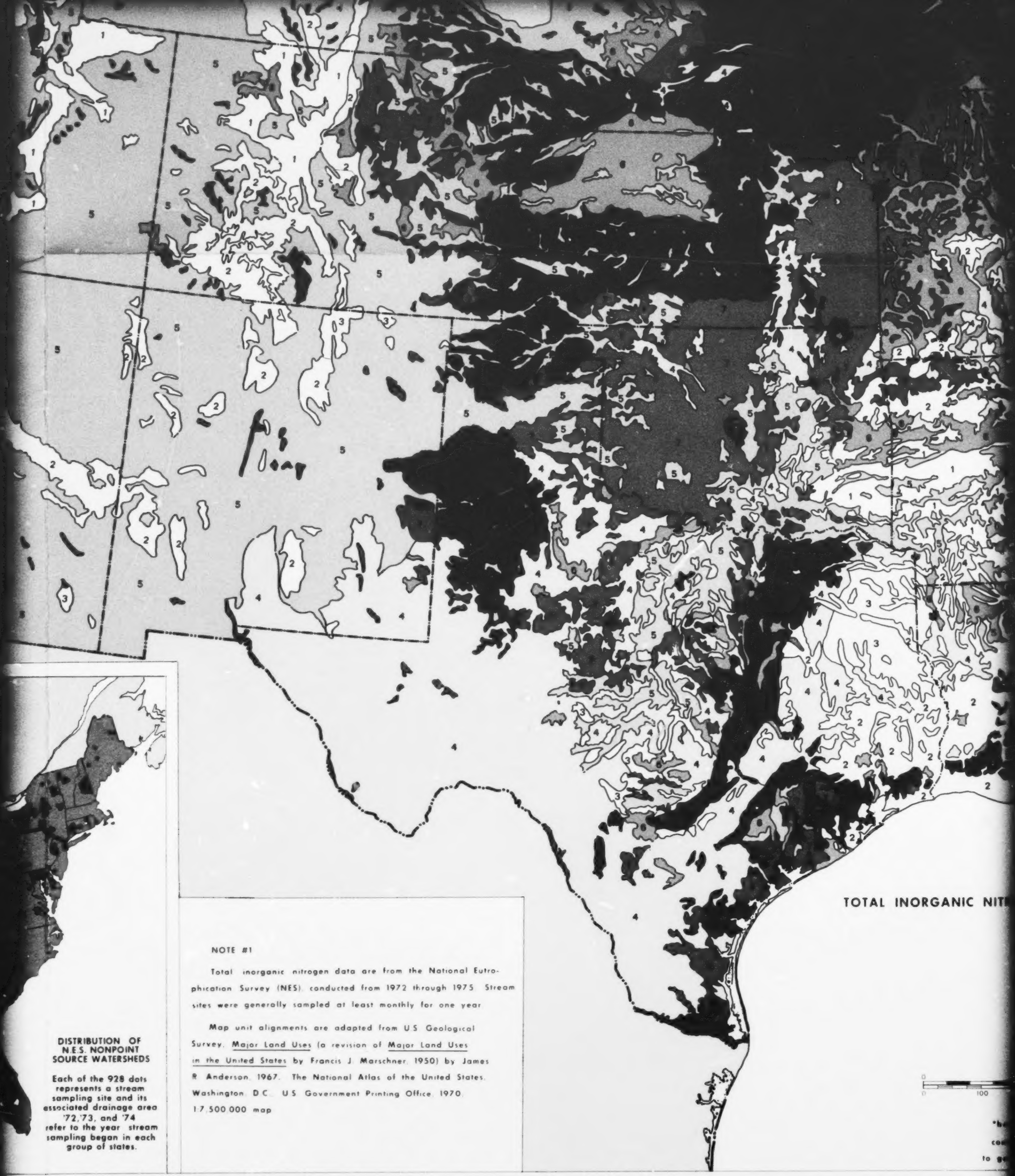
DISTRIBUTION OF N.E.S. NONPOINT SOURCE WATERSHEDS

Each of the 928 dots represents a stream sampling site and its associated drainage area '72,'73, and '74 refer to the year stream sampling began in each group of states.

NOTE #1

Total inorganic ni
phication Survey (NES)
sites were generally sa

Map unit alignment
Survey, Major Land U
in the United States b
R Anderson 1967. Th
Washington, D.C., U.S.
1:7,500,000 map.



DISTRIBUTION OF N.E.S. NONPOINT SOURCE WATERSHEDS

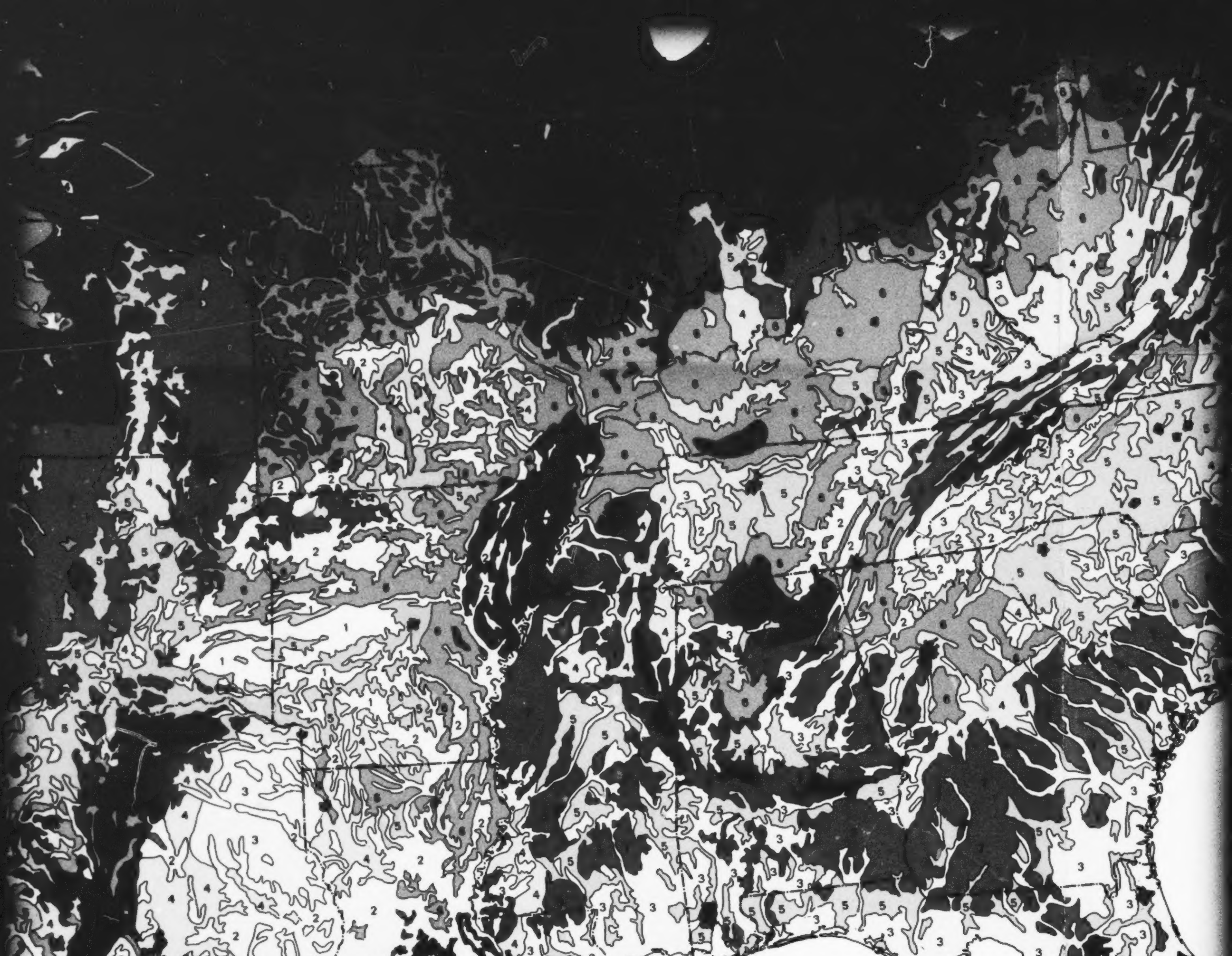
Each of the 928 dots represents a stream sampling site and its associated drainage area. '72, '73, and '74 refer to the year stream sampling began in each group of states.

NOTE #1

Total inorganic nitrogen data are from the National Eutrophication Survey (NES), conducted from 1972 through 1975. Stream sites were generally sampled at least monthly for one year.

Map unit alignments are adapted from U.S. Geological Survey, Major Land Uses (a revision of Major Land Uses in the United States by Francis J. Marschner, 1950) by James R. Anderson, 1967. The National Atlas of the United States, Washington, D.C., U.S. Government Printing Office, 1970. 1:7,500,000 map.

F


0
100
200
300
400
MILES
0
100
200
300
400
500
600
700
KILOMETERS

TOTAL INORGANIC NITROGEN CONCENTRATIONS IN STREAMS FROM NONPOINT SOURCES*

by

James M. Omernik

Corvallis Environmental Research Laboratory

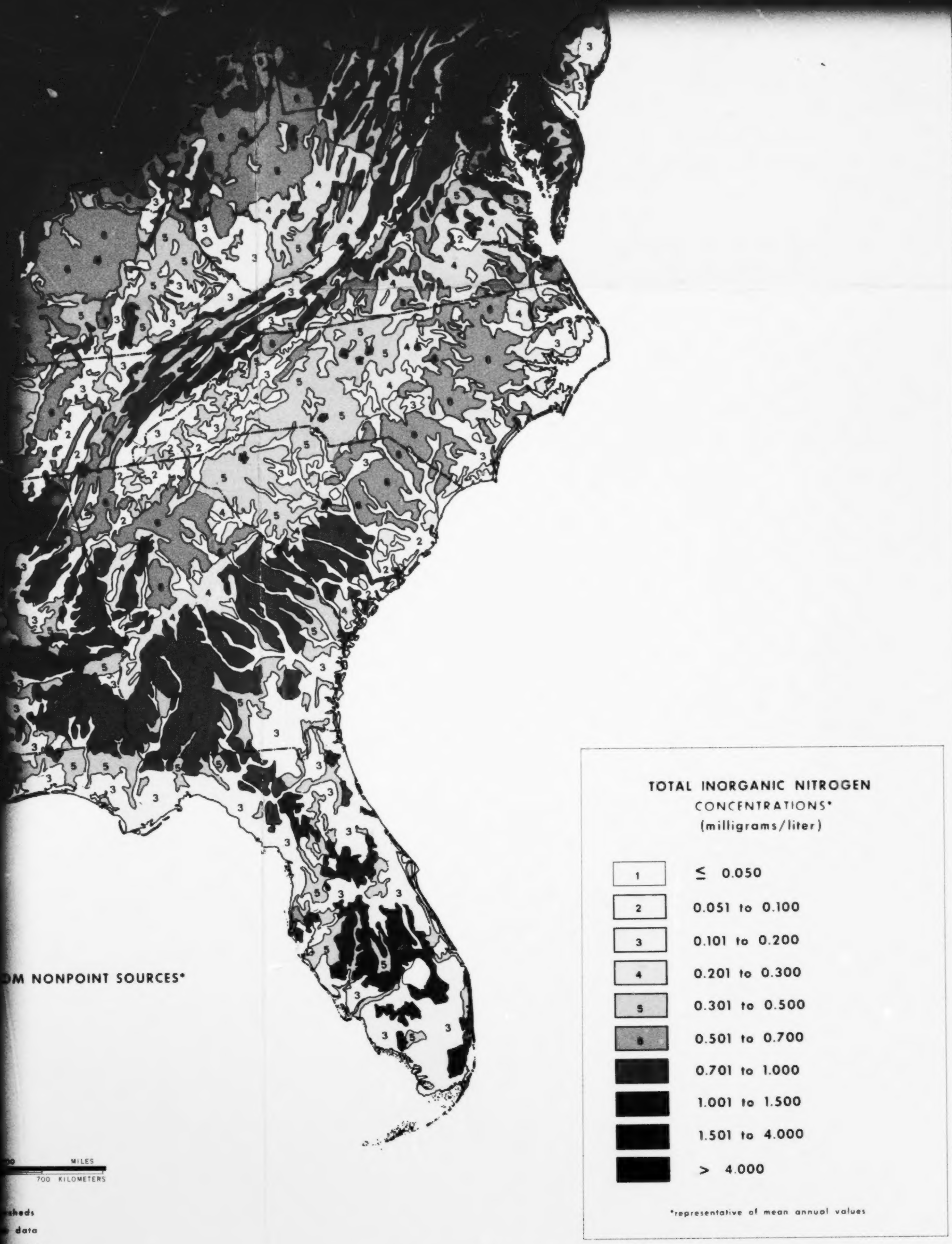
U.S. Environmental Protection Agency

1977

SCALE 1:7,500,000

*based on data from 928 sampling sites associated with watersheds containing only nonpoint sources and the relationships of these data to general land use categories and other macro-watershed characteristics.

Ce

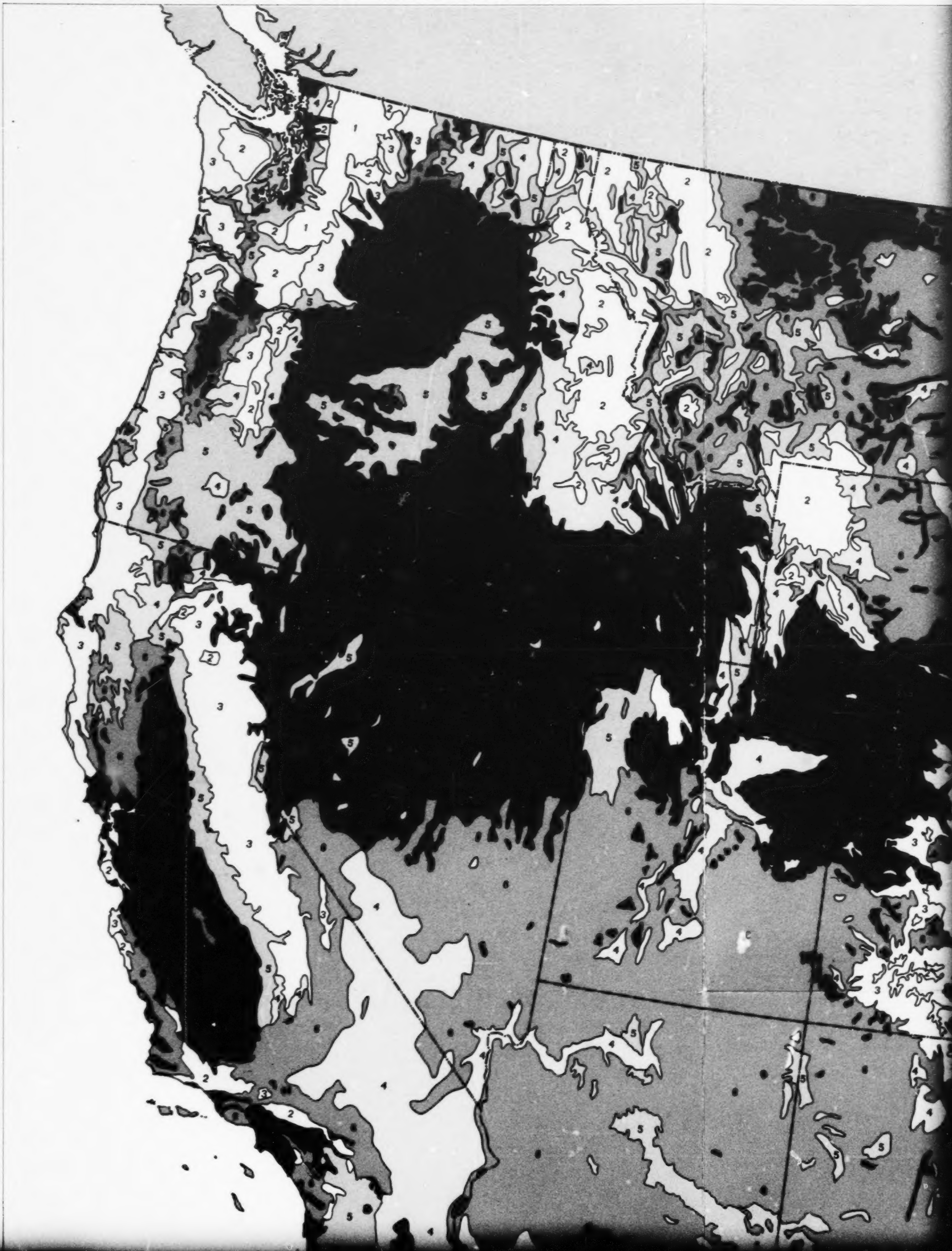


TOTAL INORGANIC NITROGEN
CONCENTRATIONS*
(milligrams/liter)
1 ≤ 0.050
2 0.051 to 0.100
3 0.101 to 0.200
4 0.201 to 0.300
5 0.301 to 0.500
6 0.501 to 0.700
0.701 to 1.000
1.001 to 1.500
1.501 to 4.000
> 4.000
*representative of mean annual values
MILES
700 KILOMETERS

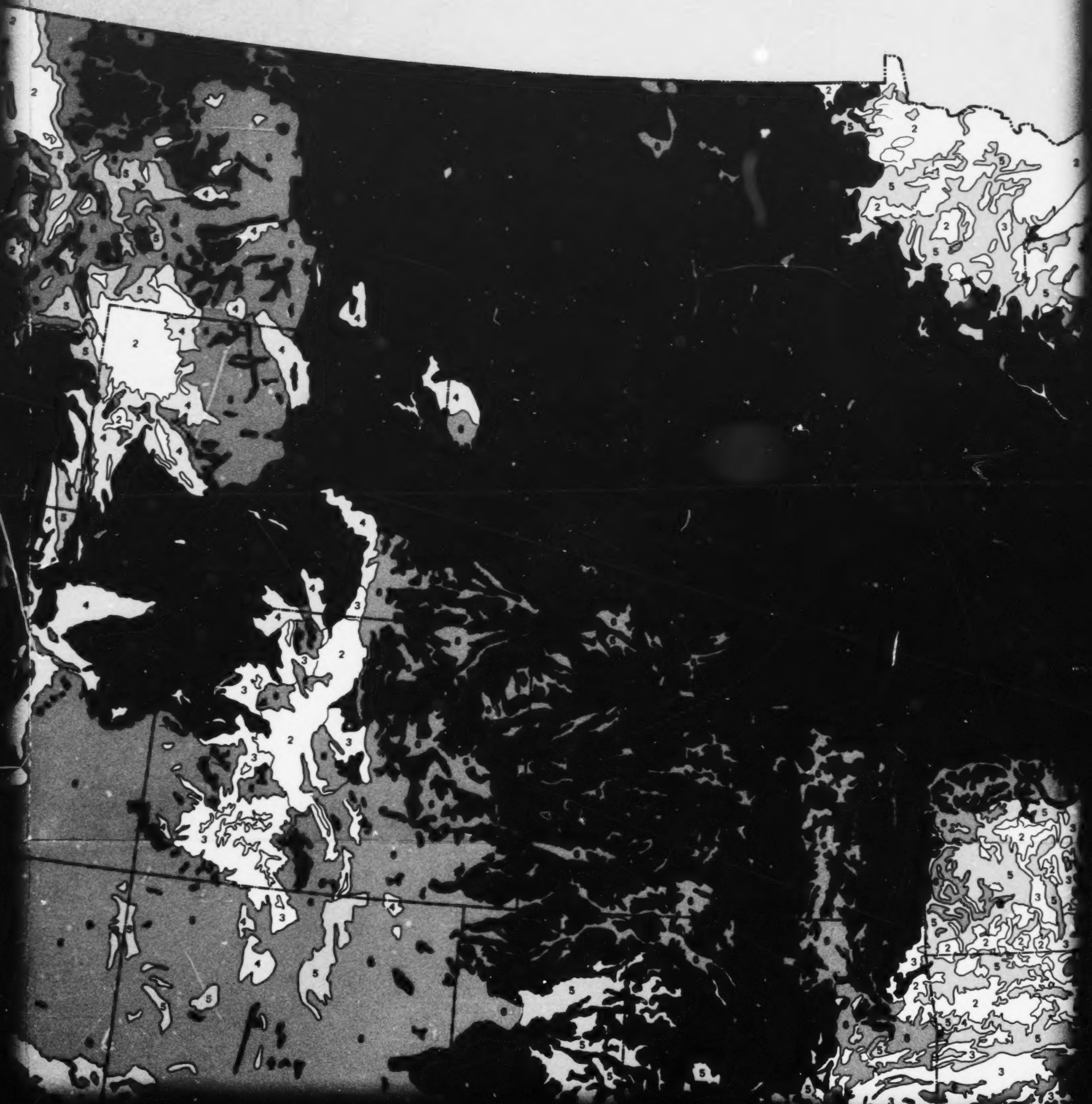
OM NONPOINT SOURCES*

rsheds
data
cteristics.

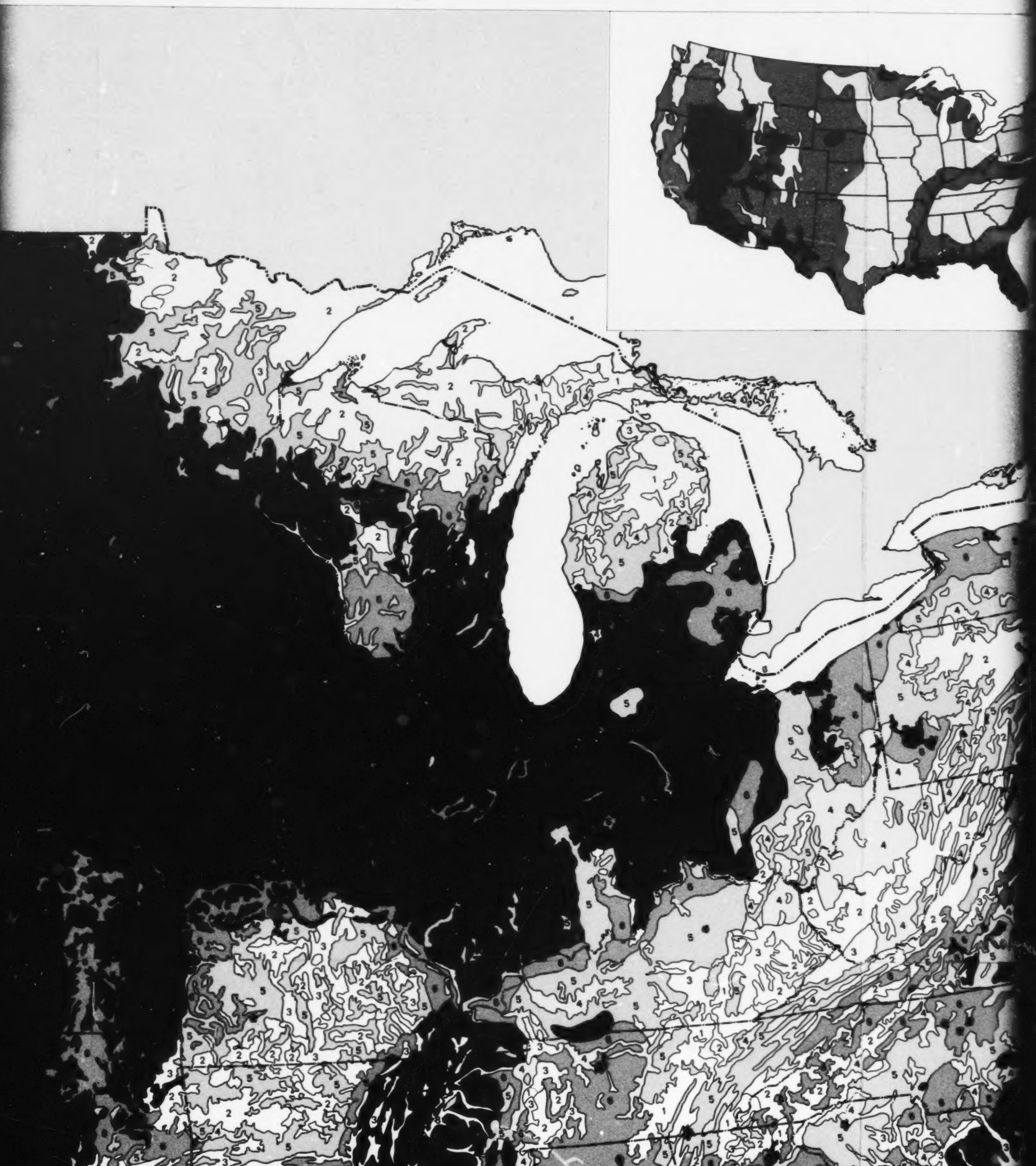
Hj



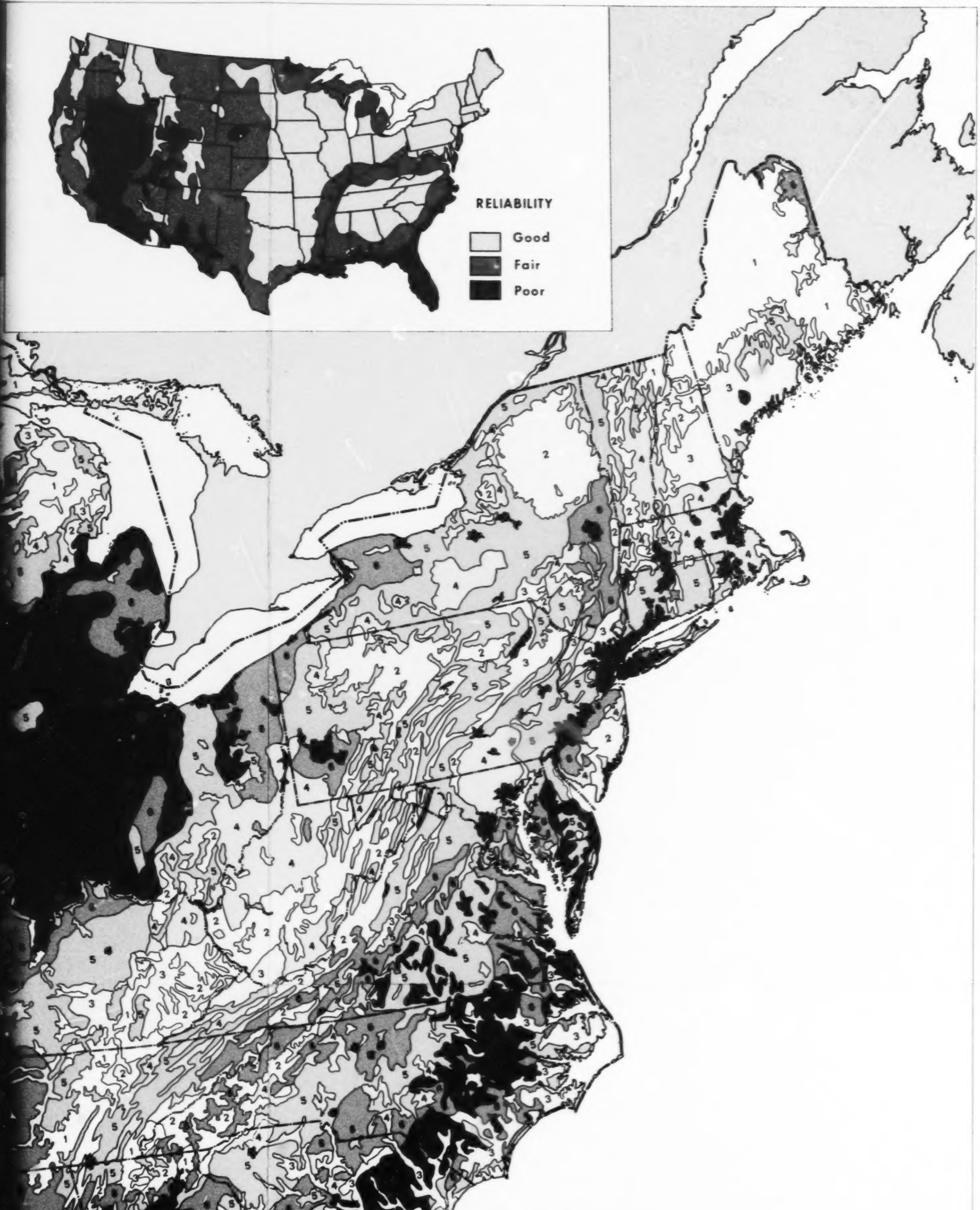
5

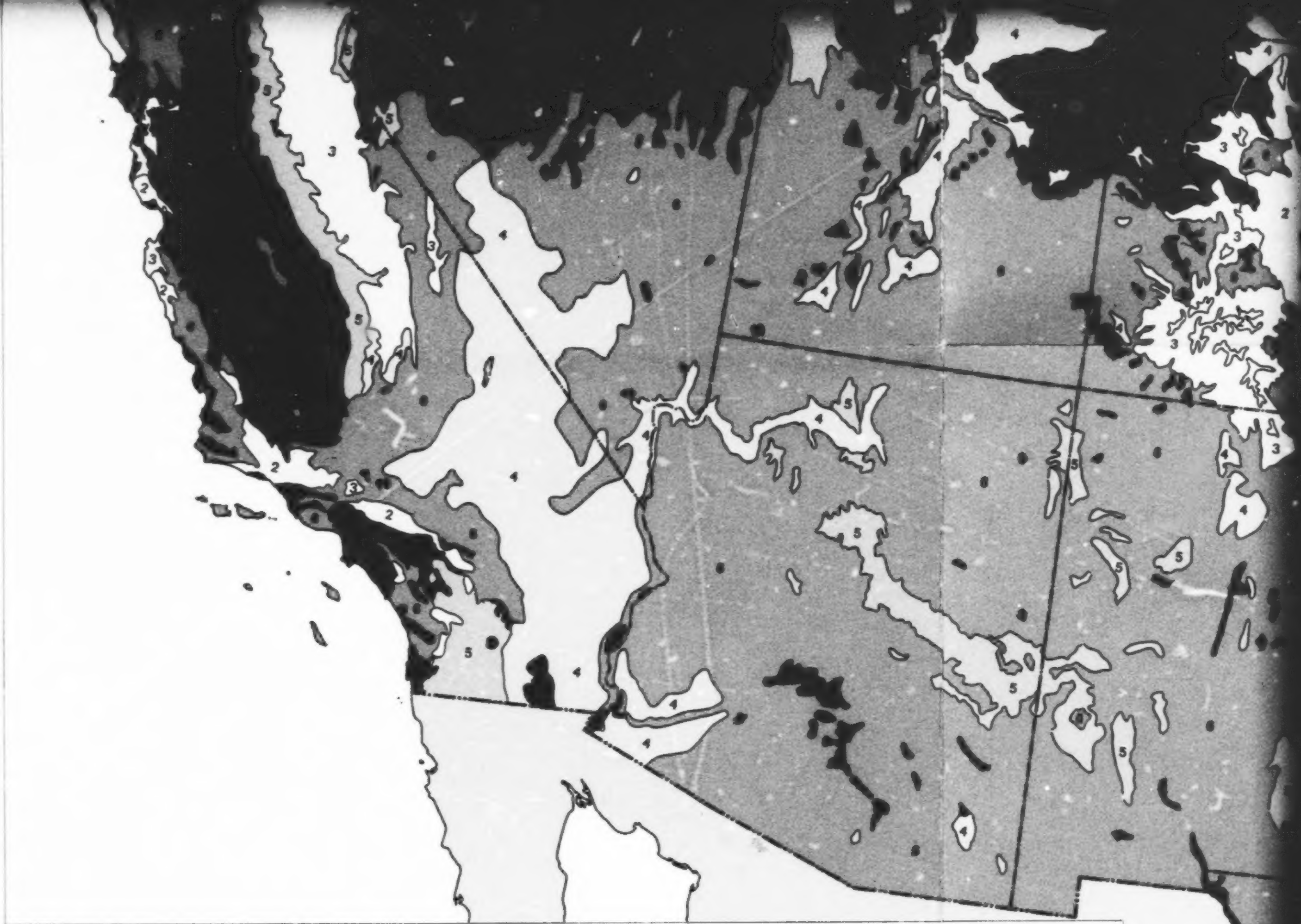


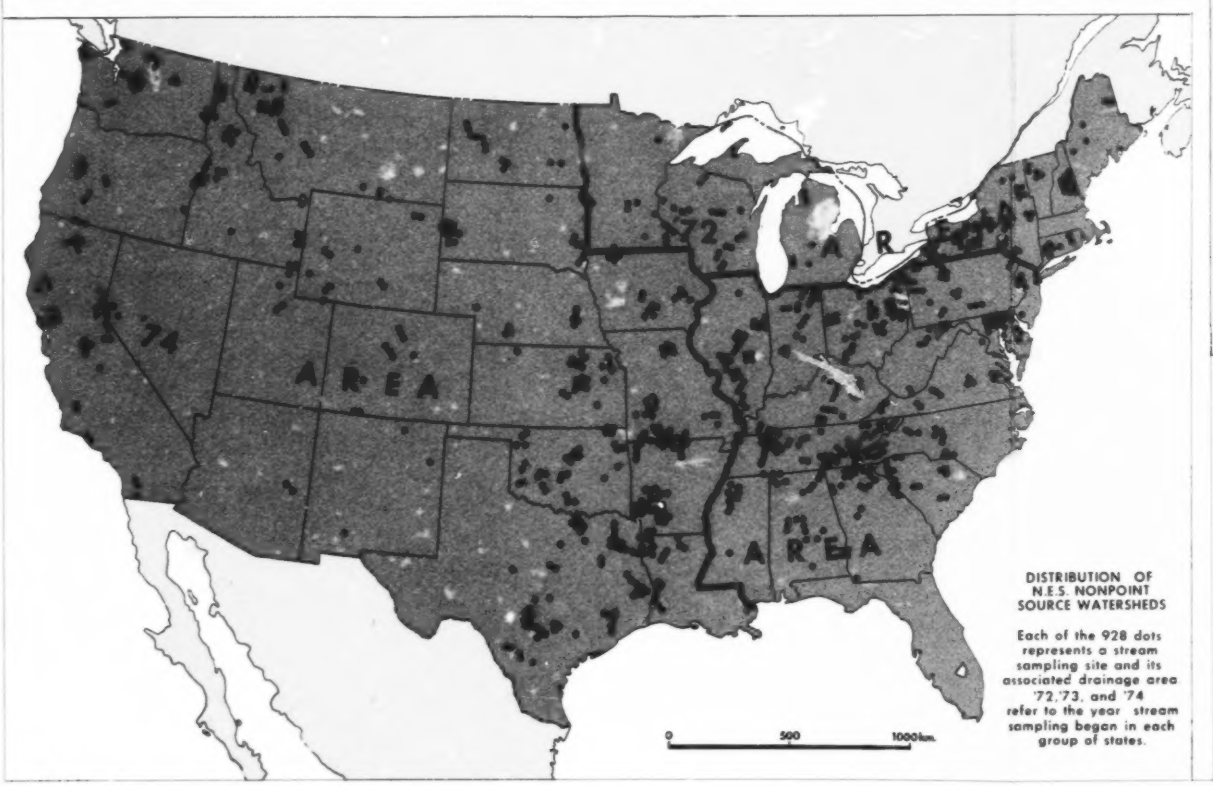
C



D


RELIABILITY
Good
Fair
Poor





DISTRIBUTION OF N.E.S. NONPOINT SOURCE WATERSHEDS

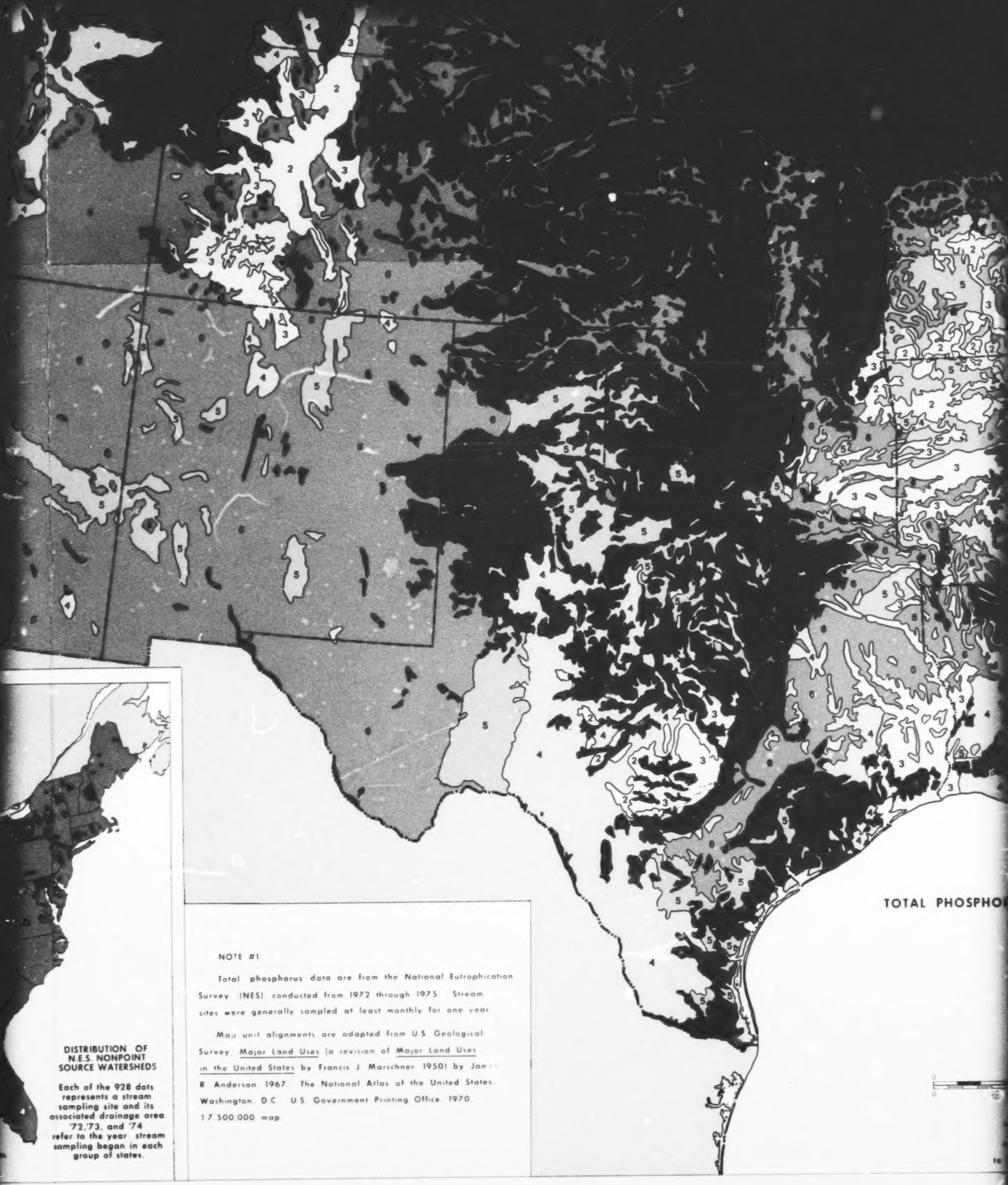
Each of the 928 dots represents a stream sampling site and its associated drainage area. '72, '73, and '74 refer to the year stream sampling began in each group of states.

NOTE #1

Total phosphorus
Survey (NES) conduc
sites were generally

Map unit alignmen
Survey Major Land U
in the United States b
R Anderson 1967.
Washington D C U.S
1:7,500,000 map

Department of Geography, Cartographic Service, Oregon State University



TOTAL PHOSPHO

DISTRIBUTION OF
N.E.S. NONPOINT
SOURCE WATERSHEDS

Each of the 928 dots represents a stream sampling site and its associated drainage area. '72,'73, and '74 refer to the year stream sampling began in each group of states.

NOTE #1

Total phosphorus data are from the National Eutrophication Survey (NES) conducted from 1972 through 1975. Stream sites were generally sampled at least monthly for one year.

Map unit alignments are adapted from U.S. Geological Survey, Major Land Uses (a revision of Major Land Uses in the United States by Francis J. Marschner, 1950) by James R. Anderson, 1967. The National Atlas of the United States. Washington, D.C., U.S. Government Printing Office, 1970. 1:7,500,000 map.

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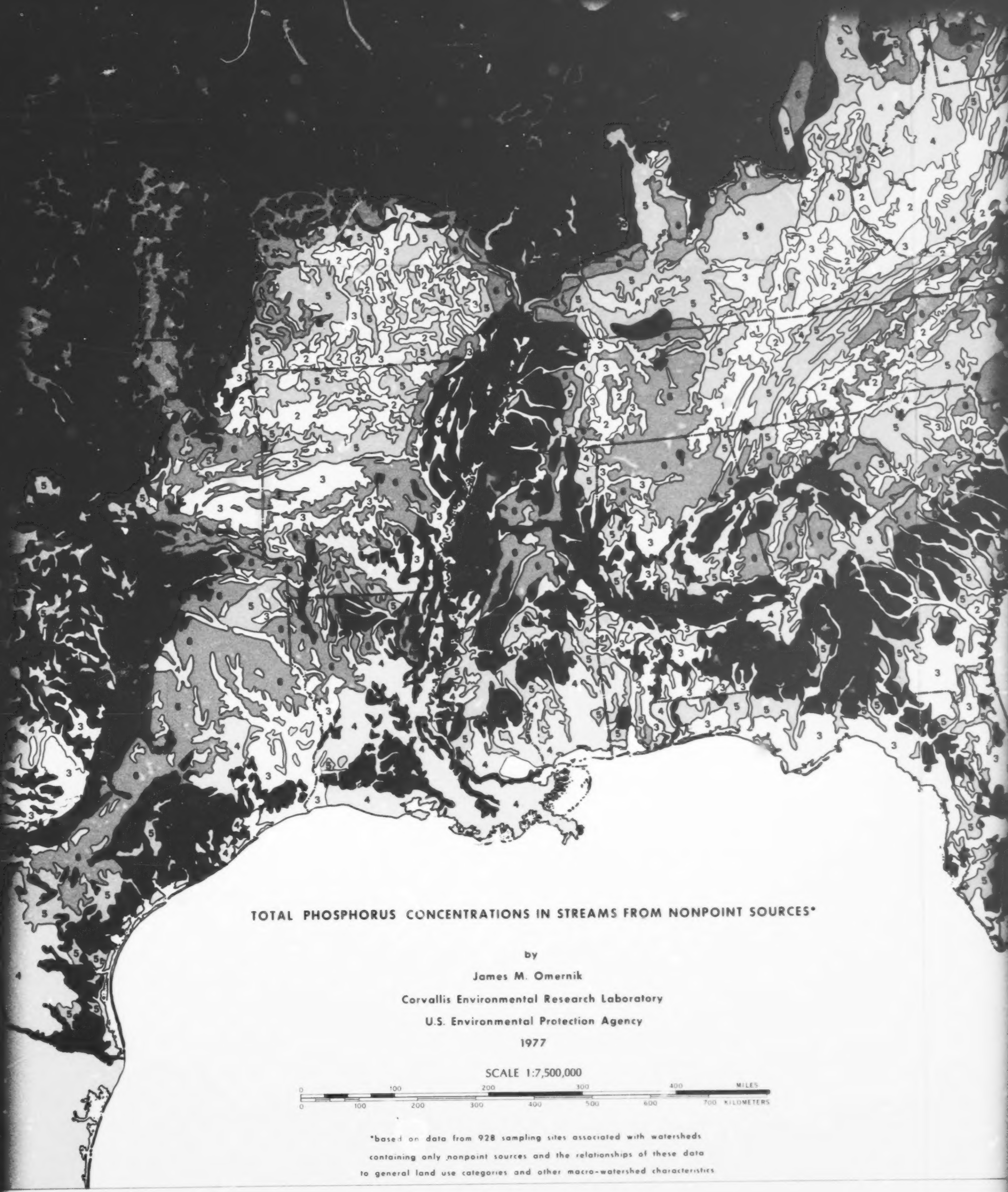


TOTAL PHOSPHORUS CONCENTRATIONS IN STREAMS FROM NONPOINT SOURCES*

by

James M. Omernik

Corvallis Environmental Research Laboratory

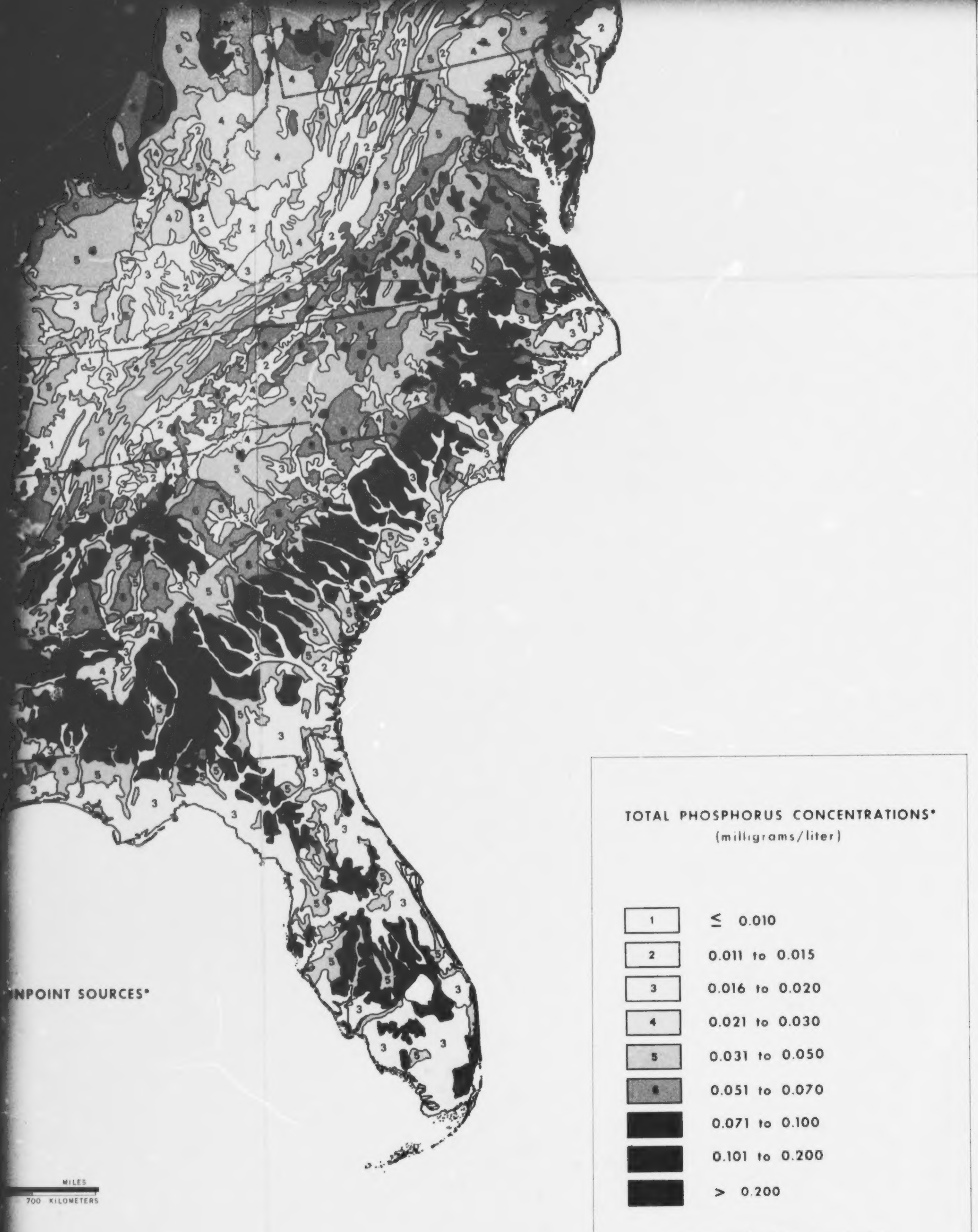
U.S. Environmental Protection Agency

1977

SCALE 1:7,500,000

0
100
200
300
400
MILES
0
100
200
300
400
500
600
700
KILOMETERS

*based on data from 928 sampling sites associated with watersheds containing only nonpoint sources and the relationships of these data to general land use categories and other macro-watershed characteristics


TOTAL PHOSPHORUS CONCENTRATIONS*
(milligrams/liter)
1 ≤ 0.010
2 0.011 to 0.015
3 0.016 to 0.020
4 0.021 to 0.030
5 0.031 to 0.050
6 0.051 to 0.070
0.071 to 0.100
0.101 to 0.200
> 0.200
*representative of mean annual values
MILES
700 KILOMETERS
1
2
3
4
5
6

NPOINT SOURCES*

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